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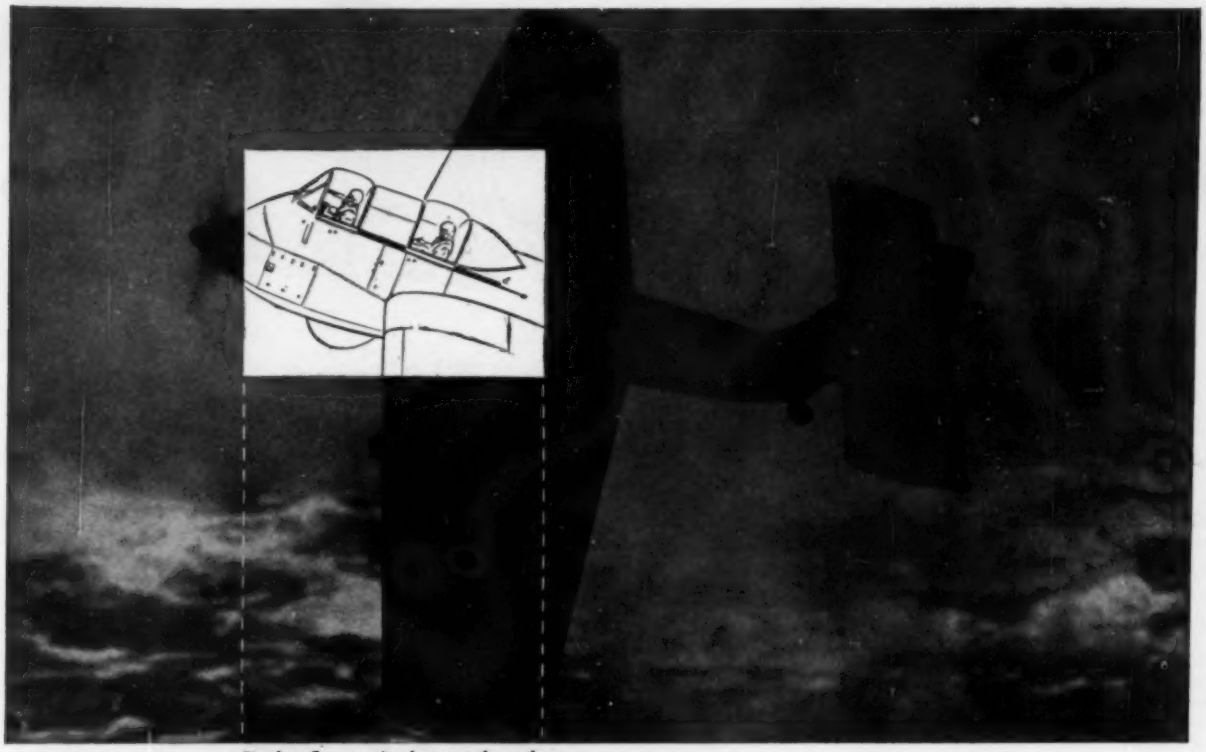
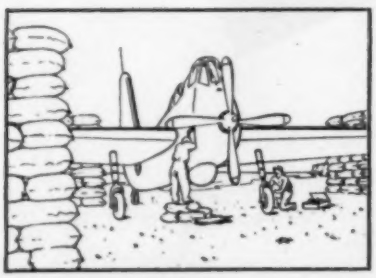


Simple to fly—even in adverse weather—the Seamew gives the pilot all-round visibility. Stalling and landing speeds are low. The fixed piston-action undercarriage absorbs the shocks of landing on a rough-and-ready airstrip.



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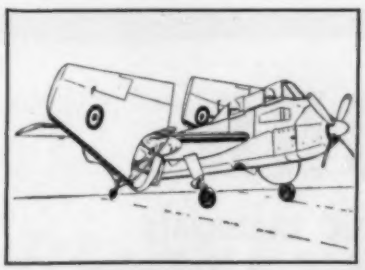

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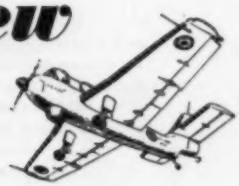

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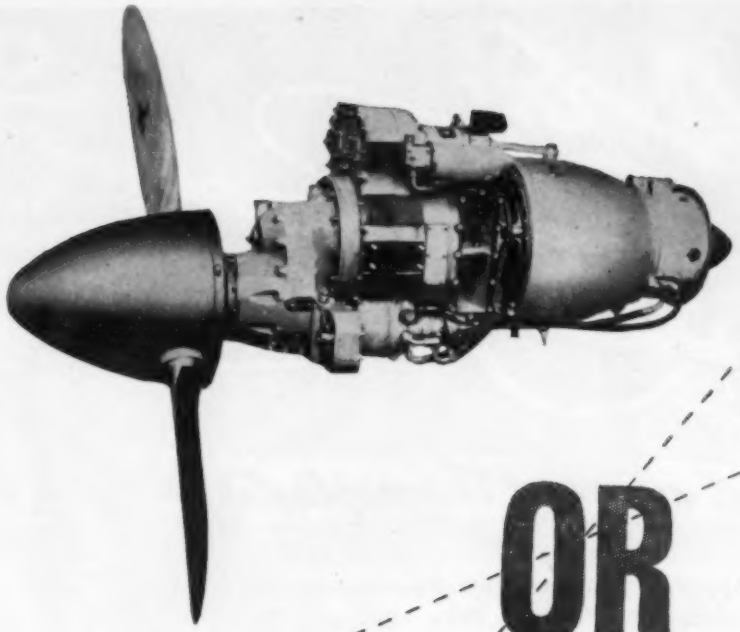

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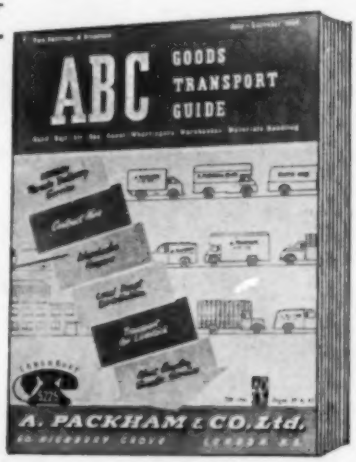

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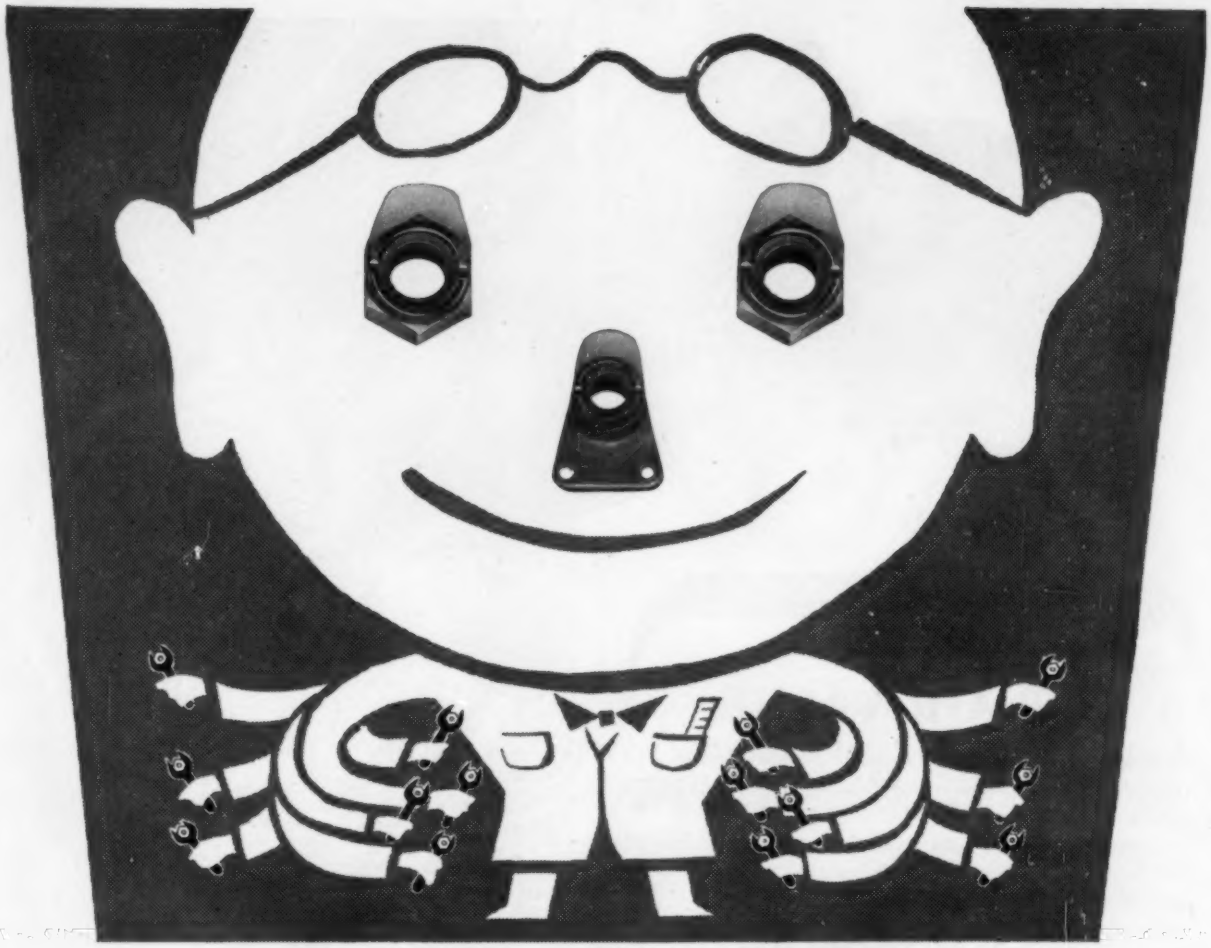

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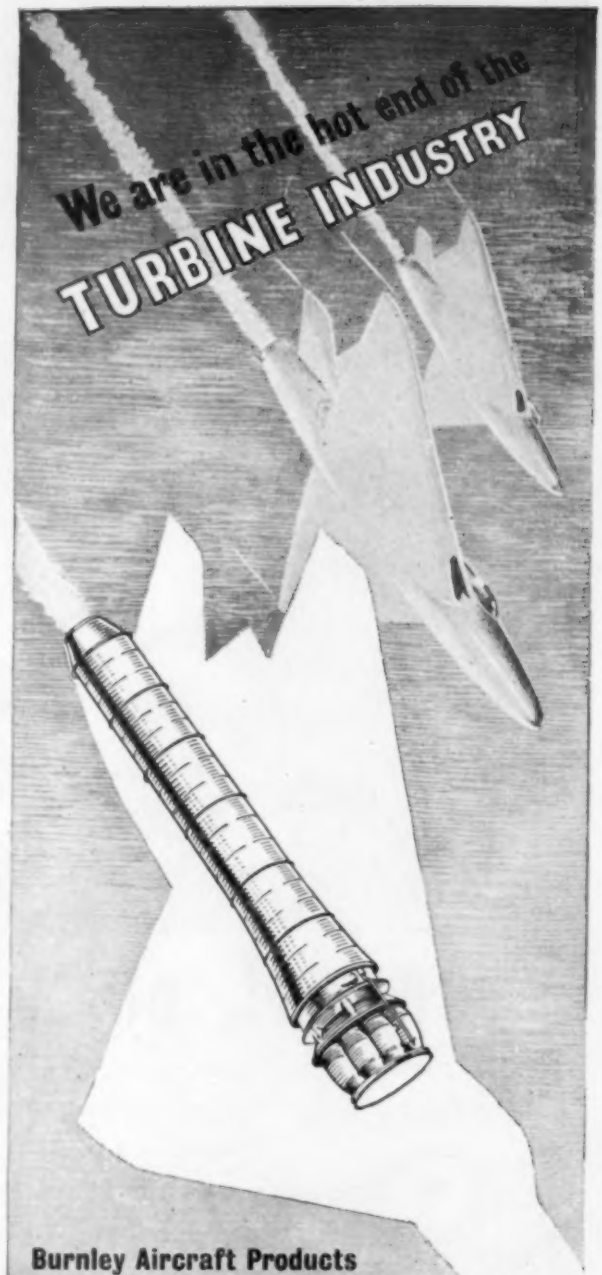

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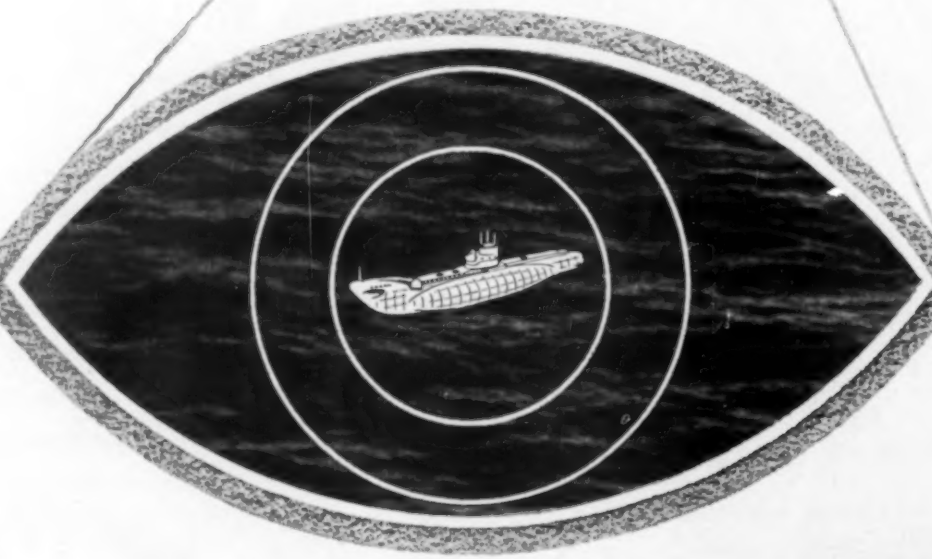

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No. 2376 Vol. 66. FRIDAY, 6 AUGUST 1954

EDITOR
MAURICE A. SMITH, D.F.C.

ASSISTANT EDITOR
H. F. KING, M.B.E.

ART EDITOR
JOHN YOXALL

Editorial, Advertising and Publishing Offices:

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IN THIS ISSUE:

Seamew Progress - - 164
World Gliding - - - 165
Night Intruder - - - 167
Across Three Oceans - 169
Boeing 707 - - - - - 175
Armstrong Siddeley Snarler 176
Jet Provost Performance 181
The Barodeurs Advance 182
Exercise Haul - - - - 186

The Snarl Before the Bite

THE Armstrong Siddeley Snarler liquid-fuel rocket motor, featured in this issue, is the precursor of mighty units which, as either the prime or auxiliary movers of new intercepter fighters, seem destined to play a leading part in the defence of vital targets in these islands.

In applying the term "new class" we are not, of course, forgetting the pioneer work of the Germans in a similar direction. This was initiated by the fitting of Werner von Braun's rocket in the tail of a Heinkel He 112 fighter, which was flying, after a fashion, about seventeen years ago. (On the first flight the pilot was blown out of the machine; and on the second—the cockpit having filled with fumes—he was preparing to bale out when the 112 made a belly landing of its own volition.)

Heinkel was prominent also in the development of rocket power for assisting heavily laden bombers into the air, but his first pure-rocket machine was the He 176, of 1938-39—from which, incidentally, the pilot could eject himself by compressed air. Curiously, it was the outbreak of war which led to the final demise of this historic venture; and, when the potentialities of the rocket-propelled target-defence intercepter were at length realized by the German Air Ministry, it was not Heinkel, but Lippisch and Messerschmitt, who were principally concerned. The outcome of their uneasy collaboration was the famous Me 163, which, quite apart from its Walter rocket, was notable in having a jettisonable undercarriage for take-off and retractable skids for landing—a formula which may yet be revived, in somewhat modified form, for the rocket fighters of the future. The Me 163 was brought to the production stage and was in action against American bombers. Its restricted fuel capacity, and lack of a pressure cabin, limited its ceiling to 40,000ft, which height was attained in under four minutes; and, though range after climb was only 22 miles, endurance could be protracted by gliding. Recognizing that this performance was inadequate, Walter developed a new rocket, having a cruising chamber, thus extending endurance under power to twelve minutes.

A specification for target-defence fighters of extremely simple and cheap construction brought forth some projects of even more fantastic conception, one of which—the Heinkel Julia—was to climb 49,000ft in 72 seconds. None of these "utility" schemes ever reached fruition, but preliminary tests were conducted with the Bachem Natter, a project of even greater audacity. Virtually a piloted missile, this was to be vertically launched from a scaffold and to climb initially at over 37,000ft/min.

Power for Tomorrow

It may well be that certain characteristics of these German projects (which we recapitulate deliberately in the knowledge that the follow-up on German researches has often been deplorably tardy and half-hearted) will be reproduced in designs now taking shape. Likewise the German practice of supplementing the thrust of turbojet fighters with one or more rocket units may be resuscitated; indeed, the Republic XF-91, the first post-war fighter designed from the outset for rocket power, is of this class.

The order of performance to be expected from future rocket fighters is indicated by the speed and altitude marks—1,272 m.p.h. and 83,235ft—set by the Douglas Skyrocket, and the extent of activity in the aircraft-rocket field was evident in our special Power Units issue earlier this year. Therein were listed rocket units by Armstrong Siddeley, de Havilland and Fairey in Great Britain, Aerojet, General Electric, North American, Reaction Motors and Wright in the U.S.A., and S.E.P.R. in France. It was noted that General Electric had a 20,000 lb thrust rocket, suitable for fighters or missiles, ready for production.

Concerning specific developments and applications little or nothing may be said; but de Havillands are known to be keenly aware of the potentialities of the rocket fighter, and it would be surprising indeed if the great Hawker Siddeley Group could not show some impressive designs round successors to the Snarler. And though we have here been concerned with fighter applications, rocket power-plants seem assured of a far wider field of usefulness than was formerly supposed. For missiles alone they will be needed in many forms and sizes; they will continue in demand as a take-off aid, and they have recently been applied to the helicopter.

FROM ALL QUARTERS

The Ministerial Changes

TRANSPORT and Civil Aviation is to have a new Minister as a result of the Government reshuffle which, last week, followed the resignations of Sir Thomas Dugdale and Mr. Lyttleton. Mr. A. T. Lennox-Boyd succeeds Mr. Lyttleton as Colonial Secretary, and Mr. J. A. Boyd-Carpenter has been appointed to the post thus vacated. Financial Secretary to the Treasury since 1951, Mr. Boyd-Carpenter is 46 years of age and has represented Kingston-upon-Thames as a Conservative since 1945. Educated at Stowe and Balliol, he has had a legal training (he was called to the Bar in 1934) and served during the war with the Scots Guards, holding various staff appointments, and posts with A.M.G. in Italy. Vice-chairman of the Conservative Parliamentary Labour Committee, he has made a special study of trades union and delegated-legislation matters. So far, he has had no contacts with aviation other than as a passenger; but those who have watched his political career know him to be a man of unusual ability and imagination and will wish him well in his new appointment.

Mr. Boyd-Carpenter.

Mr. Lennox-Boyd, who has almost completed 23 years of continuous service in Parliament, became Minister of Transport and Civil Aviation on May 7th, 1952. He has thus been responsible for implementing two major Government policies—the denationalization of road transport and the "new deal" for independent airlines. The fact that Mr. Lennox-Boyd has performed both jobs simultaneously indicates his immense capacity for hard work, and for quickly grasping the essentials of a complex problem. In his rôle as Civil Aviation Minister, Mr. Lennox-Boyd has, inevitably, steered a path of compromise between two extremes of opinion as to the respective rôles of State and civil airline operators. While his policy may not have been popular with either faction, we are certain that he himself was, and that good wishes will accompany his promotion.

New Hope for Ultra-lights

GOOD news that should help to reduce the cost of ultra-light aircraft and encourage their construction by amateurs was announced last week by the M.T.C.A., in the form of a relaxation in the requirements for airworthiness certification. This applies to aircraft not exceeding 1,200 lb all-up weight, with a stalling speed of not more than 45 m.p.h., and maximum engine power of 75 h.p., which are used solely for private purposes. To take advantage of the new scheme, the aircraft must have been built to a design approved by the Popular Flying Association and constructed under the Association's supervision. Permits to fly will be awarded on the recommendation of the P.F.A.

The following conditions apply to machines qualifying for permits under the scheme: (a) They may be flown only within the U.K. and not over populous areas; (b) they must not be used for aerobatic flight; (c) they may be flown only by day and under V.F.R.; and (d) third-party insurance will be necessary in all cases.

Bristol/Short Collaboration

AN important announcement was made shortly before the August Bank Holiday by the Board of Short Bros. and Harland, Ltd. They stated the issued share capital of the company has been increased from £2,000,000 to £2,360,000 and that the 360,000 new £1 shares have been acquired by the Bristol Aeroplane Co., Ltd., "as part of a programme of mutual collaboration between the two companies." The Belfast company invited the Bristol firm to nominate two additional directors and Sir Reginald Verdon Smith, and Mr. Cyril F. Uwins, were accordingly elected. The chairman and managing director of Short Bros. is Rear-Admiral M. S. Slattery.

Short Bros. have five factories in Northern Ireland: the main works is at Queen's Island, Belfast, where there is an airfield and flying-boat base; two works at Newtownards; one at Castlereagh (Belfast); and one at Lisburn. The current aircraft production programme consists of the Short Seamew for the Royal Navy; fuselages for the Supermarine Swift; and a production line for the Bristol Britannia. The company was also building 15 Comet 2s until this work was suspended by de Havillands pending the result of the Comet investigations. Repair and reconstruction work on Sunderland flying-boats is also continuing.

In addition to aircraft manufacture, Short's have precision engineering, general engineering and flying-school divisions, and much research work is being undertaken under various Government contracts.

Bristol Canadian Acquisition

ANOTHER statement made immediately before the holiday announced that the Bristol Aeroplane Co. has acquired the share capital of an important Canadian company, MacDonald Bros. Aircraft, Ltd., of Winnipeg. This company, which has a plant of some 200,000 sq ft production area at Stevenson Airport, is mainly engaged on overhaul work and sub-contract components manufacture; a considerable proportion of the latter activity is concerned with sheet-metal assemblies for gas turbines.

Sir Reginald Verdon Smith, Bristol's joint managing director, will become chairman of the MacDonald Board. The president will be Mr. R. J. Reynolds, who is executive vice-president of the Bristol Aeroplane Co. of Canada, Ltd., and Mr. W. S. Haggett will be executive assistant to the president, in immediate charge of the Winnipeg plant.

V-Bomber Dimensions

JUST cleared for publication are the overall span, length and height (on the ground) of the two rival V-bombers, the Avro Vulcan and the Handley Page Victor. The figures are: Vulcan B.1, span 99ft; length, 97ft 1in; height, 26ft 6ins; Victor B.1, span, 110ft; length, 114ft 11in; height, 26ft 9ins. These figures inspire the thought that the very moderate size of both aircraft belies their tremendous potential.

Egypt Means Business

THE Egyptian Government is planning the early build-up of a jet-powered fighter force, and the development of civil aviation facilities second to none, according to A. Cdre. Soliman, Egyptian delegate to the International Civil Aviation Organization. In an interview in Montreal last week, he said: "The days of corruption, and the attitude that tomorrow will be soon enough, are gone. Thanks partly to the invaluable technical co-operation we have received from U.N. agencies such as I.C.A.O., more than a dozen projects have been taken off the shelf and acted upon." In civil aviation alone, he said, the new moves would mean an outlay of some £1,071,000 over the next few months.

A. Cdre. Soliman specifically cited an ambitious Egyptian War Ministry programme which has already turned out training aircraft "similar to the Chipmunk," and which is soon to produce a "still-secret jet fighter". He also referred to moves that have centralized airport terminus facilities in Cairo, Alexandria, Mersa Matruh and Luxor. Much of Egypt's future aviation production, the air commodore said, will be shared by Egypt with other Arab countries, including Libya, the Sudan and Saudi-Arabia. Aircraft for Egypt's Air Force, he added, were being constructed with materials imported from several countries outside the Iron Curtain and armed with weapons and ammunition produced in Egyption factories. "We are finally getting things done the way you do them in Canada," he said. "Our attitude has changed. People are going to hear a lot more about Egypt from now on."

Incidentally, the Anglo-Egyptian agreement for the withdrawal of British forces from the Suez Canal Zone, initialled on July 27th, will mean that some 15,000 R.A.F. personnel will move out in due course.

BEA IN HIS BONNET: The helmeted figure beneath the new, offset, fighter-type cockpit canopy of the Canberra B.8 night intruder (other photographs of which appear on page 167) is W/C R. P. Beamont, D.S.O. O.B.E., D.F.C., chief test pilot to the English Electric Company.

QUICK TRIP: Lt. J. R. F. Overbury and—seen taking off from Bovingdon—the Hawker Sea Hawk F.B.3 in which, as related below, he established a new London-Amsterdam record. The aircraft flew at standard service loading, carrying all its fuel internally and ballast in place of ammunition. A week earlier, it had been carrying out trials from H.M.S. "Illustrious".

London-Amsterdam Speed Records

A LONDON-TO-AMSTERDAM speed record was set up (subject to F.A.I. confirmation) on July 29th when a Hawker Sea Hawk F.B.3, piloted by Lt. J. R. F. Overbury, flew from Bovingdon to Schiphol at a speed of 568 m.p.h. Observers of the Royal Aero Club and the Dutch Aero Club timed the flying start and flying finish at both airports; the time for the flight, corrected to the exact London-Amsterdam distance, was 23 min 39.7 sec.

The requirements for an inter-capital speed record are that the airport at each end should be one in accepted use for the city concerned (permission for Lt. Overbury to use London Airport or Northolt had been refused), and that the aircraft's track should pass within 30 km of the centre of each city (the Sea Hawk's track passed 29½ km from the centre of London). The official observers having calculated the aircraft's speed between airports, this speed is applied to the city centre-city centre distance to obtain a "standard" time for purposes of comparison.

F. T. Hearle Relinquishes D.H. Chair

ONE of the founder-directors of the concern which has grown into the de Havilland Enterprise, Mr. F. T. Hearle, C.B.E., F.R.Ae.S., M.I.P.E., has relinquished his chairmanship of that organization. He is succeeded by Mr. W. E. Nixon, F.C.I.S., the present deputy chairman and managing director, while Mr. F. E. N. St. Barbe, deputy managing director, becomes vice-chairman in addition.

Mr. Hearle retired on medical advice. His doctor's suggestion that he should do so was first made as long ago as 1944, and he

Mr. Hearle.

Mr. Nixon.

then handed over the managing directorship to Mr. Nixon. Six years later, however, he accepted the chairmanship on the retirement of Mr. A. S. Butler.

The de Havilland Aircraft Co. will not lose the benefit of Mr. Hearle's long experience, for he is to remain a member of the Board and will continue to take part in its deliberations.

Mr. Hearle was not only one of the five men who founded the company in 1920; he was in fact the first associate of Capt. Geoffrey (now Sir Geoffrey) de Havilland when, in 1908, they both gave up their positions in the Vanguard Motor Bus Co. at Walthamstow in order to collaborate in the building of a flying machine. From 1917 he was in charge of the experimental shop of the Aircraft Manufacturing Co., Ltd., at Hendon, where Capt. de Havilland was chief designer; and when the new de Havilland company was formed in September 1920 he became works manager, and later, general manager. He was made a director on April 6th, 1922, and managing director on November 15th, 1938.

"There were many difficult decisions and developments in de Havilland's formative years between the wars," states the company, "and in all of them Mr. Hearle's judgment played a vital part. Without a doubt, however, he bore a greater load in the years 1940 to 1944 than at any other time of his life, and as great a load as almost any top industrial executive in Britain at that testing period."

Mr. Nixon, the new chairman (who also continues as managing director), was secretary of the company from its inception in 1920, and became a director in 1931. He has managed the financial policy of the firm and its subsidiaries throughout their existence, and from 1944 has also borne the full executive and productive responsibility of the parent company. He is chairman of de Havilland Propellers, Ltd., and a director of the de Havilland Engine Co., Ltd., and of the Commonwealth D.H. companies.

Mr. St. Barbe is another of the five directors who were founders of the company. From its inception in 1920 he has built up and administered the sales organization, with its world-wide ramifications. He joined the Board in 1936 and is a director also of several of the associated companies.

Anglo-U.S. Missile Co-operation

IN a Parliamentary written reply on July 31st Mr. Sandys, Minister of Supply, announced the probability of "more positive collaboration" with the United States in guided-missile development. He said that during his recent discussions in America he found that the Administration fully shared British views on the desirability of closer technical collaboration. A list of projects which should be given priority was agreed upon, and the arrangements had since been formally confirmed.

This news is gratifying. In a leading article on June 11th *Flight* pleaded for just such a pooling of resources, pointing out that each country had much to offer the other, and that duplication of expenditure on this costly—and non-commercially-competitive—work ought to be avoided wherever possible.

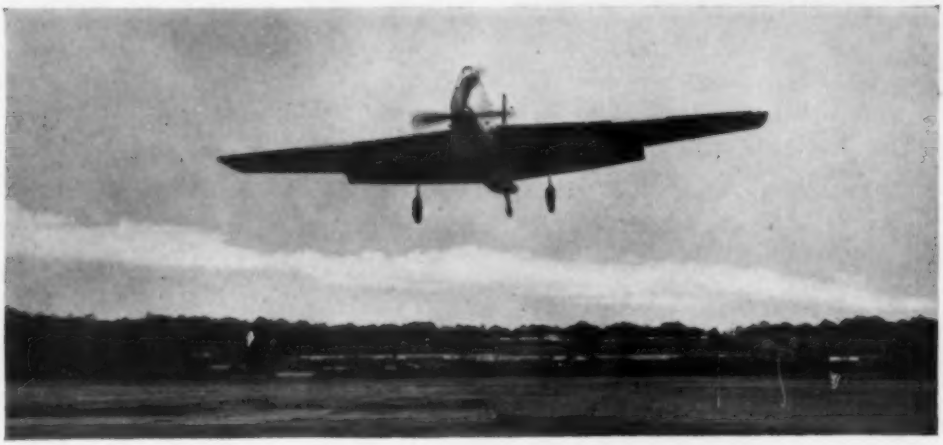
The Chiltern Hills Rally

WINNER of the Chiltern Hills Trophy Race at the bank holiday meeting organized by the Vintage Aeroplane Club at Denham last weekend was Ron Paine, flying his Miles Hawk Speed Six at an average speed of 186 m.p.h. Miss Freydis Leaf (Hawk Major) finished second, and G. R. I. Parker third, in the Messenger in which Tim Wood won this year's King's Cup. The results of the race have now brought Miss Leaf into top position in the 1954 British Air Racing Championship, with the Goodyear Trophy Race at Shoreham (August 28th) remaining. An account of the Denham meeting will appear in next week's issue.

A "Dam Busters" Party

TO celebrate the completion of the shooting of the film *The Dam Busters*, a party was held at the Pathfinder Club's London H.Q. on July 27th, when stars in the film met serving and ex-members of the R.A.F. Several of the actors made the acquaintance of the counterparts they portray—Michael Redgrave and Dr. Barnes Wallis provided an example.

Three survivors of W/C. Guy Gibson's squadron who managed to attend the party were "Hobby" Hobday, Geoffrey Rice and Douglas Webb, who are all now civilians.



The Seamew, at low level, displays the excellent visibility from the cockpit and the long droop of the unloaded oleo legs.

SEAMEW PROGRESS

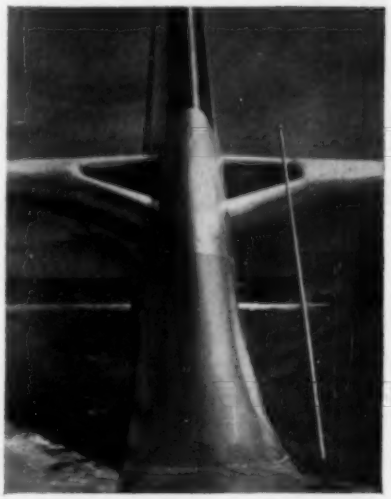
Intensive Flight Tests and Pre-production Modifications

THE Short Seamew light anti-submarine aircraft has been undergoing a series of intensive flight tests since its first flight in August 1953, and its appearance at the S.B.A.C. Display shortly afterwards. Intended for operation from all types of carriers and from "hastily contrived air-strips," the Seamew has been designed for manœuvrability, near-all-weather operation (hence its extensive de-icing gear), low landing speed, simplicity and lightness.

The company claims that, in practice, the extremely low all-up weight target has been fully met with the aid of a number of new structural techniques which, in their turn, have necessitated an extensive test programme. Some of these tests were carried out before the first prototype flew, but a second airframe, complete except for engine and equipment, was later built purely for structural tests, and mounted on a specially prepared "floating" rig; that is, the airframe was without rigid attachment to a fixed base, and so mounted that any of the various flight loads could be applied to every section of the structure at the appropriate moments. The case of the pull-out from a dive to maximum g loading was carried to destruction, and failure is reported to have occurred precisely at the predicted load.

The photographs on this page show a number of structural modifications, particularly in the tail unit and wing leading-edge. In order to provide the best possible control at speeds close to the stall, a "vented fillet" has been incorporated at the tailplane/fin junction. The photograph shows that the tailplane thickness has been greatly increased at this point, and the intakes in the leading edge can be seen to be tilted slightly upwards. This configuration replaces the inverted slots first fitted. A wide-chord slot can also be seen mounted just outboard of the wing folding joints. The fence-like ribs extending to the wing under-skin probably serve as a mounting for the slot, designed to avoid disturbing the wing de-icing boot.

Another interesting feature is the extensible tail-wheel. The oleo leg is in fact divided into two sections, the upper being a normal oleo, while the lower contains a dashpot which, when released, allows the tailwheel leg to extend fully. The Seamew lands with tailwheel fully extended, at a shallow angle of attack, and, as the wheel touches down, the dashpot compresses slowly so that full compression is reached at the end of a normal carrier landing. A catch then engages automatically to maintain the tail-down position ready for take-off.



The "vented fillet" and thick fin-root seen beyond one of the radio aerials. This replaces the inverted slots previously fitted.

No details of the Seamew's structure or equipment can yet be released, but it can be seen that the prototype has now been fitted with an "Adam's apple" radome just forward of the ventral weapons bay. The company states that the intensive test programme is aimed at obviating the need for any further modifications after the aircraft is in service. The Seamew is shortly to undergo carrier trials and initial stages of quantity production are under way.

(Left) Another view of the tail, showing arrester hook, rudder controls, and the upward-facing intake of the vented fillet.

(Right) Features to note in this ground view are the radome, starboard wing-slot, duplicated windshield wipers and tailwheel deck-wire deflector.

WORLD GLIDING

Damp Frustration and De-rigged Sailplanes at Great Hucklow

FLIGHT Photographs

The Weihe flown by Seppo Relander of Finland, who is at present placed equal seventh with Philip Wills (Sky). The vee-tailed HKS-1 is among those awaiting a launch.

"I HAVE heard of the English weather, but this is ridiculous, no?", enquires a Mediterranean voice, as its owner wonderingly surveys the rain-sodden site of the 1954 World Gliding Championships. One must in truth answer that this *is* ridiculous, *yes*. For seven consecutive days, at the time of writing, the world's best sailplanes have been unable to leave the Camphill site. On only one or two occasions have they left the ground, to soar the back-and-forth beat over Bradwell Edge; for the remainder of the time they have been grounded (de-rigged, trailer-enclosed or canvas-covered)—unable to spread their wings and enter their only true element. Such is the charm of England in July.

Not able to watch, report or discuss the performance of these sailplanes—which vary in appearance from the graceful to the starkly efficient, yet all possessing the latent romance of all unpowered flying craft—the interested observer at Great Hucklow turns therefore to the pilots who fly them. The impressive record of some of these pilots is indicated by the following notes.

By KENNETH OWEN and ALAN YATES

Philip Wills, four times British national champion, and who became world champion at the last international contests (1952, in Spain), is the only pilot to have taken part in each of the International Championships so far held. There have been four previous to this year: at the Wasserkuppe, Germany, in 1937; Samedan, Switzerland, 1948; Orebro, Sweden, 1950 and Madrid, Spain, in 1952. The runner-up to Wills in 1952, Gerard Pierre, is French national champion, and also won last year's German contests, to which he had been invited. He is strongly favoured to become world champion this year.

Ernst-Günther Haase was the top German pilot at the Oerlinghausen National Championships last year, and his initial is the "H" of the HKS-1 (Haase-Kensche-Schmetz). His colleague Wietüchter, leading after the first two days' flying at Camphill, is new to World Championships, but came third in the German Nationals. In the U.S.A. team, Dr. Paul B. MacCready, American soaring champion for the third time, was runner-up in the 1950 World Championships.

Sweden's P. A. Persson, who logged the furthest flight on the opening day of this year's contests, was world champion from 1948 to 1950. Among the other pilots who have been highly placed in World contests are Cuadrado (Argentine) and Gehriger (Switzerland), who came fourth and fifth in Spain in 1952. Geoffrey Stephenson, the present British National Champion, was the first pilot to soar across the English Channel (in 1939); a feat repeated 11 years later by Lorne Welch, now flying with his wife Ann in the new tandem T.42, Britain's entry in the two-seater class. Another well-known British glider-pilot, Cdr. "Nick" Goodhart, R.N., who is now based at Washington, D.C., is putting his U.K. knowledge at the disposal of the American team by crewing for Dr. Paul MacCready.

Our opening report of the championships in last week's issue

Lorne and Ann Welch appear amused prior to take-off in the new Slingsby T.42. Their 40-mile flight on the only two-seater-class flying day so far brought them into third place, behind Switzerland and Yugoslavia. (Right, upper) The Swiss WLM-2, withdrawn from the contests due to basic faults in stability and control. (Lower) Latest of the "tin-can" line, simple and efficient, the American all-metal Schweizer 1-23E.

Seven Slingsby Skys were entered in the single-seater class—more than any other type. Here, Ilbert de Boer flies the Dutch Sky.

Ernst-Günther Haase, German national champion and pilot of the vee-tailed HKS-1.

WORLD GLIDING . . .

described events at Camphill up to Saturday, July 24th. The succession of warm and cold fronts coming across from the Atlantic, which had prevented flying on Friday and Saturday, continued on the Sunday, as related below.

Sunday, July 25th. Warm, moist air from the West brought with it a continuous drizzle during the morning, but the improvement forecast for the afternoon—and experienced—resulted in a 40-mile goal race to Sandtoft (a disused airfield between Doncaster and Scunthorpe) being set for the two-seater class.

The partially cleared sky provided weak convection over the site, but none of the two-seater machines was able to leave the ridge. The all-different shapes soaring over Great Hucklow, however, provided a worthwhile sight not only for the ground crews and organizing personnel but also for the 9,000 spectators who, attracted from the depths of Manchester and Sheffield by the Derbyshire sunshine, jammed the twisting lane which leads to Camphill. Although none of the two-seaters was able to get away from the site, a fair amount of cumulus was building up to the east, and the official observers at Sandtoft reported that conditions there were especially good.

Two European designs: the tandem Yugoslav Kosava (No. 42), flown by Rain and Komac; and the single-seat PIK-13 from Finland, flown by its designer, Antti Koskinen.

Monday, July 26th, showed no change, with continuous rain all day. Repairs to the HKS-1 at Slingsby's works at Kirbymoorside were completed, and the machine returned to the site for spraying and polishing. Other news was that the WLM-2, flown by Gehriger of Switzerland, had been withdrawn from the contests. This machine had been found to lack stability and to have control faults which made it unacceptable for competition flying; it had evidently been brought to the championships while insufficiently developed.

Tuesday, July 27th brought something new, met.-wise, in the form of fresh, unstable air from the north-west. The air was so moist and so unstable, however, that too much cloud built up; in addition, there was a 20-knot wind, gusting to 50 knots at the launching point. This dangerously high wind was the main reason for the initially suggested "free distance" task being cancelled, a mutual decision between pilots and committee.

The two Russian representatives to the OSTIV conference at Buxton, Victor Iltchenko and Pavel Tourchin, arrived on the Tuesday and paid a visit to Camphill. Only the previous day Iltchenko had been nominated by the gliding commission of the F.A.I. for the award of the Lilienthal Medal for his flight of 520 miles, a world two-seater record, from Moscow to Stalingrad last year. Tourchin is the vice-secretary of the Russian Central Aero Club. Also present during the week at both Buxton and Camphill was M. Charles Fauvel, designer of the lightweight Fauvel AV-36 flying-wing sailplane, one example of which has now been brought over to this country.

Wednesday, July 28th, saw little change in the weather; there was too much cloud and too much rain at first, although an improvement was expected later in the day. As on previous occasions, this improvement arrived too late for competition flying to be possible, however, and the early-evening blue sky and cumulus was still punctuated by fierce showers from a procession of dark grey cu-nims.

Thursday, July 29th. Once more, gales and low cloud prevented competition flying in the morning. Later in the day, however, the nine two-seaters were launched for a free-distance task, but none was able to contact thermal lift and so get away from the ridge. After they had been on the beat for an hour and a half, conditions worsened as further storms came in, and the sailplanes were forced to land.

The organization responsible for indicating just how bad the weather is going to be at Camphill is very well equipped to do this efficiently. Under Mr. C. E. Wallington, himself a glider pilot and met.-veteran of last year's Nationals forecasting, is a useful group from the Air Ministry Meteorological Office. Part of their equipment consists of two "Mufax" machines (working on the same principle as that for transmitting and receiving Press photographs by radio) which print facsimile weather charts, complete with station observations, transmitted directly from the central forecasting office at Dunstable. The charts can be received only 1¼ hr after the observations have been made. In addition, a daily weather flight is made over Derbyshire by a Spitfire, which reports air temperatures, humidity readings and cloud observations up to 20,000ft, by radio direct to Camphill.

The British habit of talking about the weather has already been acquired, with good reason, by the foreign gliding teams at present in this country. It is too much to hope that they may forgive us our weather; but it is right that they should be well-informed.

As we go to press, the single-seater lead has been taken by Pierre of France, with Wills a close second and Wietüchter (Germany) third. Jugoslavia leads in the two-seater class.

(To be concluded)

NIGHT INTRUDER

English Electric Canberra B.8 Now Flying

ON July 23rd the B.8 variant of the English Electric Canberra made its initial flight from the company's Samlesbury, Lancashire, airfield. The B.8 is said to be the most versatile of all the Canberras, being designed to perform in two rôles. The first of these is long-range night intrusion into enemy territory, with the object of harrying ground targets—especially communications—and the second is the Canberra's normal commitment of high-altitude bombing. The aircraft can readily be converted from one rôle to the other.

For night intrusion forward-firing armament is carried in a fairing beneath the fuselage, and "a variety of weapons" under the wings. The armament is, of course, controlled by the pilot, who is provided with the new fighter-type canopy seen to advantage in these first flying views, which depict the B.8 prototype in bomber guise. (The diligent spotter will observe that the airframe is VX185—originally the prototype Canberra B.5.) Slightly offset to port, the canopy affords an extensive all-round view. A second crew-member—the navigator—is in the nose, with a "wide range of navigational equipment". The B.8 has the extra fuel capacity and "more powerful" Rolls-Royce Avons which characterize the Canberra B.6 bomber and P.R.7 strategic reconnaissance aircraft.

After the first flight W/C. R. P. Beamont, D.S.O., O.B.E., D.F.C., described performance as "most satisfactory" and the new cockpit arrangement as "particularly good".

HERE AND THERE

FROM ME, TO YOU: On July 13th a French AMX tank weighing 13.9 tons successfully boarded a Breguet 763 Deux Ponts from its transporter trailer. The upper cargo floor of the 763 was removed to accommodate the turret and 5½yd-long gun barrel. The 763 can carry two tons of stores, in addition to one AMX, for 1,250 miles.

Rolls-Royce Nuclear Nucleus?

IT was reported last week that two scientists who have been working at Harwell on the development of structural materials for nuclear-propulsion motors have joined the staff of Rolls-Royce, Ltd. The company would make no comment on this report.

America Talks Jet Transports

ON Monday next, August 9th, in Seattle, the Institute of the Aeronautical Sciences is holding its rather oddly titled symposium, *The National Turbine Powered Air Transportation Meeting*. Fourteen papers are to be read during the three-day meeting and delegates ("with proper security clearance") will tour the Boeing plant and see the 707 prototype.

Vulcan Incident

WHILE carying out a series of high-speed landing tests at Farnborough airfield on July 27th, an Avro Vulcan, piloted by the company's chief test pilot, "Roly" Falk, suffered braking-parachute failure and overshot the concrete runway. In the pilot's subsequent successful efforts to avoid a group of workmen the aircraft ran on to muddy ground and the undercarriage collapsed, causing minor damage.

Oerlikon Missiles for Japan?

THE Oerlikon Machine Tool Works of Zurich are hoping to sell guided missiles and heavy-calibre automatic guns in Japan, and have sent Herr Stahmer—wartime German ambassador to Japan—to explore the market. He has already had talks with officers of the Japanese Defence Forces as well as with Mr. Kimura, the Defence Minister. The missile concerned is the MX-1868, ten of which, together with launching devices, computors and other components, could be supplied for a million dollars. It is reported, however, that a budget of only 444,444 dollars (*sic*) is available to Japan in the 1954 fiscal year.

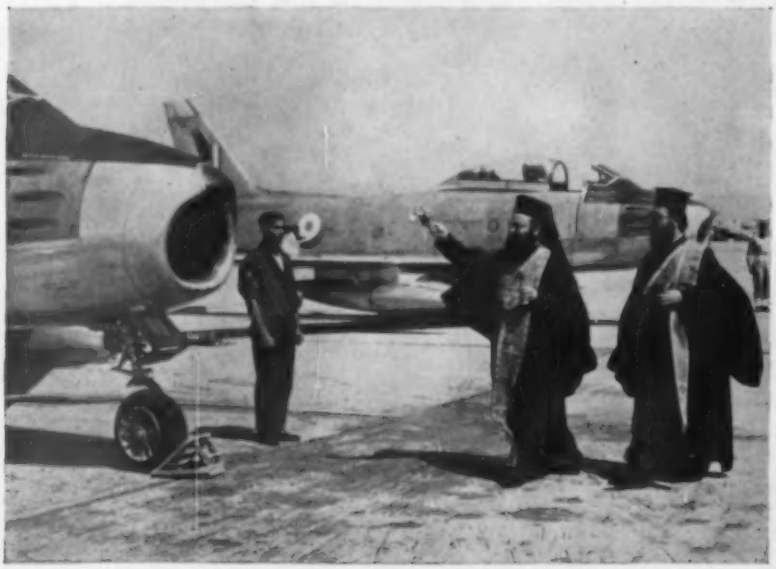
Amphibian ¾ Record

THE world's straight-line non-stop distance record for amphibians (F.A.I. Class C.3), which has stood at 1,429.7 miles since 1936, was broken recently by the Marchesa Carina Negrone in a Piaggio P.136-L (two Lycoming 240 h.p. engines). She flew from Ghedi airfield, Brescia, Italy, to the alighting area on the Nile at Luxor in 13 hr 34 min, covering a distance of 1,865 miles. Her co-pilot was Signora Ada Marchelli and the P.136's take-off weight 7,716 lb (normal a.u.w. is 5,840 lb). The distance record for the 3,400-5,000 kg class and equivalent women's records were also broken in the same flight.

Valuable for Reference

NOW available are reprints, in 8¾in × 11¼in brochure form, of the main review sections of two recent special numbers of *Flight*. These are *Military Aircraft of the World* (with over 170 illustrations), price 2s 6d, and *Helicopters of the World* (60 illustrations), price 1s 6d. Both are obtainable from newsagents, or by post at 3d extra each from Iliffe and Sons, Ltd., Dorset House, Stamford Street, London, S.E.1.

BLESSING, by Ministers of the Greek Orthodox Church, on some of the first of 82 Canadair-built Sabres given to Greece by the Canadian Government. The ceremony took place at Eleusis on July 20th, when the aircraft were officially presented to the Greek Government by Mr. Grande, the Canadian Chargé d'Affaires, and were accepted by Mr. Canellopoulos, Defence Minister.



"Just step into my office, will you? I want to discuss this new jack you designed."

Brazilian Helicopters?

DR. FOCKE, the German designer who has been employed by the Brazilian Air Ministry since the war, announced recently that Brazil is considering the production of two new helicopters which he has designed. In a newspaper interview he said that one of the new helicopters was a cargo-passenger type, which "could carry 20 passengers and three tons of cargo." The second machine he identified only as a "high velocity" design. The big helicopter would be powered by "three conventional petrol motors, such as are employed in the DC-3," and had been designed for economical production and maintenance.

Full circle brake entirely within the wheel

ALREADY IN AIRLINE SERVICE

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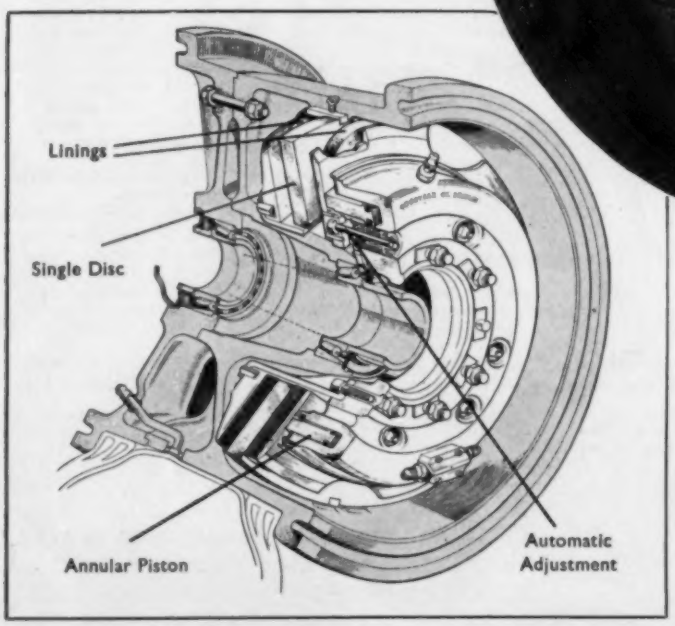

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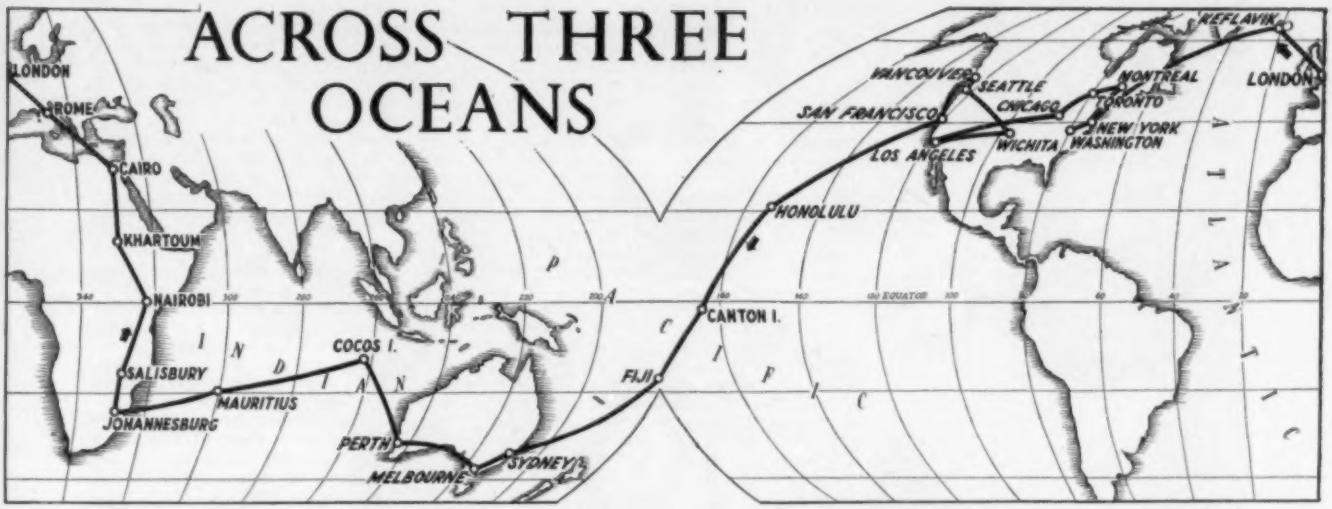
ACROSS THREE OCEANS



This "Picasso projection" has the merit of indicating compactly the route taken and the positions of the more remote places mentioned below. Distances should not be measured or compared too exactly.

Thoughts on Eighty-five Hours' Intercontinental Flying: Q.E.A.'s Wallaby Service

By THE EDITOR

NORTH ATLANTIC air crossings are now commonplace, while to cross the Pacific—by stages—there is little alternative but to use the air. A flight across the Indian Ocean, on the other hand, is still an unusual experience. I recently had the opportunity to make all three crossings, each in a different type of airliner, and thus to form some comparisons.

It is not proposed to say very much here about the B.O.A.C. Monarch service on a Stratocruiser from London to New York, because at its best—and there is no better service—it is simple praise to describe it as luxuriously uneventful. The B.C.P.A. DC-6 service across the Pacific from Vancouver and San Francisco to Sydney is now no more since Qantas took over, and in any case some aspects of it were described by Mr. Frank Beswick, M.P., in an article in *Flight* of October 30th, 1953. The Qantas Wallaby service on a 749 Constellation from Sydney and Melbourne to Perth and then across water to Cocos Islands, Mauritius and Johannesburg, will thus receive pride of place in these recorded impressions.

I recall the North Atlantic as cold and routine, the Pacific as lengthy but glamorously punctuated, and the Indian as three long nights with daydreams between.

In the air the weather appeared much the same over all three oceans, and the sea in the southern hemisphere—when visible—was blue or silver-blue, in contrast to the grey-blue and sometimes grey-green of the Atlantic. The Indian Ocean offered the most magnificent sunsets and cloudscapes. Canada's snow- and ice-covered wastes far north of Montreal and the steely blue ice-encrusted rivers winding over them were in marked contrast with the palm-covered, sand-fringed Pacific atolls and the lush green larger islands with red-brown mud flowing through their veins.

The first breath taken as one stepped out of the hot aircraft cabins—already becoming stuffy as soon as the engines were stopped on the tarmac—was a sharp gasp of ice crystals at Keflavik, but a choking gulp of hot, wet blanket at Canton Island.

Unlike airline operators, I am always pleased to find myself in an almost empty aircraft. To this extent I may unknowingly suffer from a mild kind of claustrophobia. The Monarch Stratocruiser was full of people, jingling crockery and cutlery, and, a champagne and brandy haze (all on the house). As an aircraft the Stratocruiser is above average in quietness and one can sleep quite comfortably with legs out in the reclining seats.

For the Pacific crossing the DC-6 was almost empty and this made it seem very roomy and airy. The full sleeper accommodation for some passengers was much appreciated, and it is to be hoped that sleepers on long-range aircraft will not give place entirely to "sleeperettes" and similar reasonable but definitely inferior night accommodation. Of course, there is an hour's chaos in the morning while beds are folded and their late occupants become temporarily supernumerary.

On the most tiring of the Ocean crossings, the 749 Connie was full and the aircraft itself was that bit noisier than the other two. Normal reclining seats were fitted and conditions were good enough. This aircraft was probably the best of the three from the operators' point of view, because it was presumably earning the most.

The Qantas Indian Ocean service is a remarkable one in several respects, as will be judged from this account. It really owes its existence to the fall of Malaya and Singapore, in January and February, 1942—disasters which Great Britain viewed through eyes different from those of the Australians and, perhaps, appreciated less because of the other disasters and great dangers nearer home.

The Coral Sea victory (anniversary celebrations of which took place in Sydney and Melbourne in May last, with visits from the U.S.N. carrier *Tarawa*) almost certainly saved Australia from invasion. This narrow escape, the earlier Beaverbrook signal, and the fact that Australia's air life-line through Singapore to Great Britain had already been cut off, have had a profound effect upon Australian thinking and actions ever since. It is for this reason that

Departure-point for the first ocean crossing—London Airport—would be familiar to many readers. Here is Vancouver, the take-off point for the second ocean crossing. A DC-6 of the now extinct B.C.P.A. is ready for the flight to Australia. This machine has now been handed over to T.E.A.L.

"Flight" photographs

ACROSS THREE OCEANS. . .

the pioneering of an Indian Ocean air route, which avoided landing at any point in Asia or India but linked up in Africa with direct flights to Europe, was (and still is) regarded as a most important national undertaking.

If even a token service could be opened it was held to be worth a lot of trouble and expense. The early pioneering flights of Capt. P. G. Taylor (upon whom was conferred a knighthood in the recent Birthday Honours) may be recalled. His first crossing was in 1939, when he flew a Consolidated 28 flying boat *Guba* from Port Headland to Mombasa. The first return flight over the Wallaby route was made by Capt. L. R. Ambrose in a Lancastrian.

The outcome following the 1948 Qantas survey is a twice-a-month Indian Ocean return service—the Qantas Wallaby service—between Sydney and Johannesburg. The links making possible an intercontinental service, flown entirely over water by a landplane are, of course, the Cocos (or Keeling) Islands and the Island of Mauritius.

There are already sufficient people wishing to fly on this route for Qantas to be considering a step up to weekly flights as soon as aircraft are available. The alternative, more probable since the sale of 749 Constellations to B.O.A.C., would be to introduce their new and larger Super Connies on this route. It is not only Sydney, Melbourne, Perth and Johannesburg traffic which is carried, for a link-up is arranged at Cocos with Skymaster services to and from Djakarta and Singapore. As much as 4,000 lb of freight are regularly carried on this shorter route to the Cape.

There is little to be said of the early stages of the journey as far as Perth; they are like any other over-continent night flight in a Constellation. For my own comfort I would prefer the service to leave Sydney at, say, 2000 hrs instead of 2300, and this would allow Melbourne passengers (and the relatives and friends who now see them off at 0230) more sleep on the Monday night. The hours gained could be spent agreeably in Perth and its port of Fremantle if the arrival time at Cocos must remain a fixture.

Immigration and Customs clearance, which may be made at Melbourne even though some hours are spent in Perth the next morning, were carried out simply and courteously, and there was a businesslike air about the preparations at the overseas terminal at Essendon Airport. The arrival and departure of a Connie is, in fact, something of an event there, and Mr. A. R. Perrier, Q.E.A. manager at Melbourne, was present to see us off. A seven-hour flight was forecast with weather good all the way. The aircraft, VH-EAE, named *Bert Hinkler*,* was just over half full, and as soon as everyone was installed the engines were started and checks made to the accompaniment of grinds, whines and groans which characterize Connie take-off preparations and seem so out of place in a piece of smooth precision machinery.

Of the flight itself I remember little—which is as it should be on a long night haul. I always enjoy the feel of the take-off in a Constellation, which roars and surges forward as eagerly as a racing car. By the same token, a DC-6 seems to move away like a big sedan with fluid transmission, and one sometimes feels anxious as to whether it is trying hard enough to accelerate and get airborne in the length of one runway. It always does, of course.

Leaving the lights of Melbourne behind, the exhaust flames from the Cyclones flickered fiercely violet and electric-blue in the moist, cool air. The navigation lights—red on my wing-tip—flashed evenly, and the airscrew disc reflected the top white light. Quickly we settled down to a steady climb to about 17,000ft where, unusually for the time of the year, tailwinds awaited us. In very little time as it seemed I was being lightly shaken; it was daylight again and breakfast was ready with just comfortable time to eat it, wash, shave and tidy up and prepare for the landing at Guildford Airfield, Perth.

During the let-down I was invited forward by Captains Uren and Ralfe to enjoy the magnificent view of the attractive city and the port of Fremantle. Bonfires laid lazy blue snakes of smoke across the morning scene, and parks, a race course and a fine new bridge stood out clearly.

A coach ride through Perth pleasantly occupied the time spent in refuelling and preparing for the first ocean leg. Whereas there had been 25 passengers on the 7 hr 25 min flight from Melbourne, 31 of the 38 seats were now to be occupied. (Aircraft VH-EAB *Lawrence Hargrave*, and VH-EAC, *Harry Hawker*, are modified to carry 42 seats.)

At 1301 hours local time the Connie was started up and fifteen minutes later we were airborne and turning on to our north-westerly course. Captains A. Wharton and M. Bamman were at the controls, assisted by 1st/Off. C. King, Nav/Off. C. Meers, Rad/Off. D. Dillon, and Eng/Offs. R. Hodell and S. Paine. In the cabin were Flight Stewards J. Brown and A. Woodbridge, and Flight Hostess J. Gilkes.

Of the weather on the over-ocean sections of the Wallaby route, it may be said in general that between Perth and Johannesburg

**VH-EAE has now become G-ANTG under B.O.A.C. ownership and VH-EAF, G-ANTF. VH-EAA and VH-EAB also go to B.O.A.C.*

(Left) Perth, Western Australia, has attractive airport buildings which have been cleverly and economically contrived from a Nissen-hut nucleus. (Below) The control tower and parking area at Cocos main island with, right, a Q.E.A. 749 Constellation making a refuelling stop.

"Flight" photographs

Retrospective views of construction work at Cocos and an aerial picture of the fine white coral strip as it appears today. Wallaby passengers who pass through in darkness see it as it appears in the night photograph—wet and glistening.

the climate is dominated by the south-east trade winds. South of latitude 10 deg south, the north-west monsoons influence the weather in winter; this can effect the Cocos-Mauritius stage. In the Cocos area the weather may be affected by the Inter-tropical Convergence Zone to the north. Again speaking generally, conditions over the sea are best during daylight and better during the winter than during the summer. The weather is usually fine but overcast. Over the northern sections of the route a half cover of alto-stratus at about 11,000ft can be expected, and in the summer occasionally cu-nims are to be seen separated but extending to over 40,000ft.

On the Perth-Cocos leg, covering 1,832 miles, there are several aids available—for example, A.D.F. at Geraldton, Pearce homer, H.F./D.F. from Port Hedland, and back bearings. Direction Island is available in emergency. Geraldton on the coast above Perth is an alternative airfield and up to a certain point on the flight a diversion to Djakarta would also be possible. After that the aircraft is dependent upon an "island reserve" of three hours fuel, there being no diversion or alternative available. Records show that the islands may suffer brief "black-outs" but that a safe landing would be possible some time within any three-hour period. A very careful check on course with D.R. checks and plotting with the aid of sun and moon lines all help towards accurate navigation.

Pressure-pattern navigation is often good on the Perth-Cocos flight, but seldom later on the ocean sections of the route. Cocos has V.H.F./D.F. and its beacon is usually effective up to 600 miles. At 15,000ft D.M.E. comes in between 150 and 200 miles. Cocos 2 offers homing facilities.

This D.M.E. is most effective, as I saw for myself; it is a 200-megacycle Qantas/A.W.A. set, but not being I.C.A.O. approved it cannot be used elsewhere. It codes by light, or with the sound of a small hooter. If more than about ten aircraft tried to use it at once it might be saturated and, much more important, if used in America it would overlap with television frequencies. I.C.A.O. are thus pressing on with 100-megacycle D.M.E.

The weather around Cocos is usually cloudy and the island itself has frequent showers. The average annual rainfall is 77in and the temperature 81 deg. There are met. observers on Cocos, but the forecasting is done at Perth. Shipping observations are used as well, and a shipping plot is carried by Q.E.A. Wallaby aircraft in case of emergency. The I.T.C.Z. proper does not normally extend as far south as Cocos.

Cocos civil airstrip on West Island became usable in July, 1952, but work on it continued for a month or two after this. The area was first occupied and a P.S.P. strip laid by the Royal Engineers for the R.A.F. in 1944-5. The runway is made of coral and is 8,500ft long by 150ft wide, with 1,000ft cleared over-run each end. It cost Australia some £A700,000. No. 2 airfield construction unit of the R.A.A.F. was responsible for the work on behalf of the Department of Civil Aviation. Cocos West Island itself is four miles long and varies in width between a quarter and a half mile. It has a prevailing wind (S.E. trade) of 10-15 kt and the runway QDM is 152 deg m. Some of the palm trees bordering the strip are higher than the 60ft control tower.

That the V.H.F. homer frequency, so far out in the ocean, should be the familiar 118.1, was unexpected. Q.E.A. has worked out a procedure for let-down on D.M.E. and this is regularly practised on the Link Trainer.

Those interested in history may like to know that the islands were discovered by Captain V. Keeling of the East India Company in 1608-9. The inhabitants originally came from Java. John Clunies-Ross settled there in 1827 and his descendants still own their original possessions and govern the islands. Australia was

Worthy of reproduction in the best glossy travel magazines, this delightful atmosphere-photograph was taken at Cocos quite near the runway on a previous visit by a "Flight" staff photographer.

Plaisance Airport building is not imposing but it serves its purpose admirably—in handling the small amount of traffic through the restful Island of Mauritius.
"Flight" photograph

ACROSS THREE OCEANS . . .

given the administration of the islands by the British Government shortly after the last war when the Qantas air route had been planned. Captain Freemantle had "included" the group in the British dominions in 1857. Australia's first official contact with the islands was in 1914 when the German cruiser *Emden* raided the cable station. H.M.A.S. *Sydney* was warned and successfully engaged the *Emden*, the wreck of which is still on North Keeling Island. In the '39-45 war the Japanese shelled the cable station and Lord Louis Mountbatten set up a military establishment which for a time included 10,000 Service personnel. (This and other information appeared in *Flight* for July 18th, 1952.)

For the passengers the flight to Cocos was pleasantly uneventful and most people dozed or read and occasionally glanced at the wonderful cloudscapes. The ocean when visible looked enormous and deserted. For the last hour into Cocos I sat up front and enjoyed the view. Light was fading, and cloud was patchy. The D.M.E. came in at 160 miles and proved to be very sensitive and accurate.

Nightfall is the time for awe-inspiring colour and cloud formations. After a short period of broken and, on occasions, bumpy grey cloud the Connie came out into the open and was confronted with what looked like a heap of giant coals with apricot flames springing up behind them. The larger cumulus clouds stood out on both sides, and one great splash of cu-nim sprouted anvil points at two levels. Above all was a roof of indigo of a tint never to be seen in Europe. The radio compass was already tuned in to the Cocos beacon. When we were half-an-hour out we made contact by V.H.F. with Cocos control and started a long descent.

Just before we started the let-down into Cocos the flight conditions were 2,000/2,050 r.p.m. and 31/32in boost for the engines; our height was 14,000ft; the indicated airspeed 179 kt; and the outside air temperature 9.5 deg C. The heading was 315 degs. For the let-down the same speed was maintained with descent power of 1,700 r.p.m. and 28in of boost. This gave a steady 500ft/min descent.

We passed through several thin layers of broken cloud until finally, at about 5,000ft and some 15 miles range, we saw the first glimpse of the beacon and its reflection in the cloud. Shortly afterwards the first cockpit checks were made prior to landing, and we received confirmation of the local weather and altimeter setting. There being no other aircraft in the area the controller told us to stand by while he took a look outside to see how the small rainstorms were blowing across the island. He warned us of small patches of cloud at about 400ft. When we finally broke cloud there was still sufficient light to see the horseshoe atoll clearly outlined with its big lagoon strangely patterned in white and green.

A few lights twinkled, and down-wind we could see the coral runway and floodlit parking area clearly, a suggestion of breakers on the outer reefs and some high palms lining the island strip. The approach took us through cloud, but soon the runway could be seen ahead from about 400ft and a mile-and-a-half range. It glistened wet and looked very small. Earlier the captain had spoken of tricky down-draughts when crossing the palm-clumps. On this occasion we felt no currents, landed lightly and pulled up with half the runway to spare.

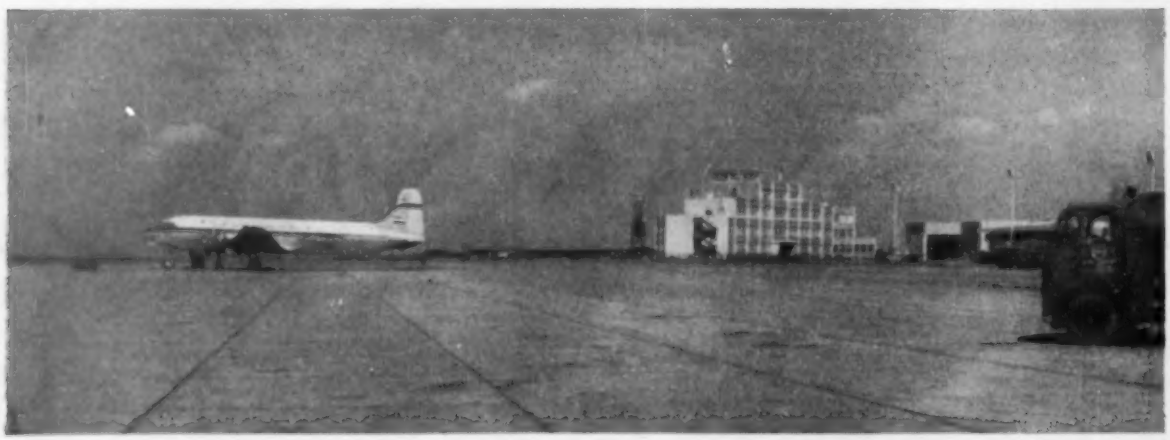
The moon shone as we stepped out for a 2½-hr stop; the temperature and humidity were terrific. Iced drinks and a meal were welcomed and then a few energetic passengers (*not* including several elderly South African ladies on board) went on to the bright sand and tried to catch the little pink crabs that raced in their hundreds diagonally into the water as one crept up to them. Their speed and elusiveness matched those of a rabbit. After this the offer of a shower seemed good. Our only regret was that the stop was short and by night. The stories of the excellent fishing made us very envious. But even here one finds the inevitable "Coke" and beer bottles strewn about. On Canton Island it was broken lavatory pans. . . .

The next stage from Cocos is the longest scheduled over-water flight in the world—a distance of 2,670 miles. It is always flown at night—usually on a direct rhumb line track—because astro-navigation is essential. The usual stars—Arcturus, Spika, Regulus, Orion and so on—are shot and at least one good fix is taken each hour. Two sextants are carried. As the captain said, you may be on your own for nearly 2,000 nautical miles.

In fact, Rodriguez Island is about 300 miles out from Mauritius on track, and there is a good homer for which I was told the M.C.A. is responsible. Q.E.A. have improved the facilities at Mauritius (which they share with Air France). On leaving Cocos, D.M.E. can be worked backwards. Reunion Island with scanty facilities provide a possible emergency alternative. The usual island reserve of three hours' fuel is carried. Westbound the Mauritius broadcast station is a help, and Cocos, Plaisance (Mauritius) and Tananarive (Ivato) sport H.F./D.F.

On this stage the weather conditions might be described as better than average although Mauritius itself is almost always under cloud. The winds over the ocean at Constellation heights seldom average more than 10 kt.

The scene on arrival at Johannesburg—wide open spaces and clear morning air at the 6,000ft level of Jan Smuts Airport. The aircraft is a South African Airways Skymaster; beyond it is the administrative building surmounted by the control tower. "Flight" photograph



The fourteen hours of darkness of which the flight occupied 11 hr 10 min certainly seemed to drag a little, and it was a real relief to see Rodriguez Island move dimly past. A grey cloudy morning obscured Mauritius until we were within fifteen miles. The only bright objects were the few remaining stars seen before the let-down was begun.

At ten miles' range one could see clearly the strange mountain forms—locally attributed to the tempers and chisel of a giant or the devil, but quite obviously volcanic in origin. We skimmed over the beach for a straight-in approach; the hills would have necessitated a right-hand circuit had the wind been significant. I was told that a careful watch has to be kept because the local people are apt to use the runway as a car park when they go bathing. The airport, like the rest of this British Island, is French in atmosphere and French-speaking. A little primitive by European and other mainline standards, it is nevertheless quite adequate. One felt that the over-elaborate forms which had to be filled in even by transit passengers were overdue for revision or, better, cancellation.

The people who received us so early in the morning were friendly and cheerful, and it was not long before we were bumping up the long hill to Curepipe and its hospitable Park Hotel. Here passengers enjoy a day "night-stop" during which they may change £1 or so into rupees and see the various beauty spots about the island, examine extinct volcanos and peer at stuffed and skeletal Dodos or giant tortoises of extreme longevity, in the Port Louis Museum.

Mauritius is an island with a very long history and it has changed hands and nationalities a number of times. Remarkably, the tropical cyclone records for the area had been kept regularly since 1726 and, for example, one may discover that very severe incidents of this sort occurred in 1773, 1868 and rather less severe ones in 1761, 1818, 1857, 1863 and 1874.

The record of wind speeds is also valuable for airline operators, and, for example, the observatory at Pamplemousses has records to show that the wind reached 58.9 m.p.h. on March 21st, 1879, and 75.8 on April 29th, 1892. Much more recently, on January 16th, 1945, while the average wind strength for one hour was 58.8 m.p.h., one gust of 98 m.p.h. was recorded.

The Mauritius-Madagascar area experiences about four tropical storms during each summer period, it was learned. They usually originate in the west half of the Indian Ocean. The upper south-east trade winds are strong during the winter but are lighter in the summer and vary between south-east and north-east. The visibility is nearly always good.

Between 7 p.m. and 9 p.m. dinner was served at the Park Hotel and transport collected us at 2320 hr. The rather ancient bus rumbled—mostly free-wheeling—back to the airport to suit a take-off time of 0025.

While the passengers settled in for a sleep or snooze until about 0630, the crew settled down to an astro or pressure pattern stooge of 1,920 miles. A weather eye in the true sense was kept open for lurking cu-nims, and every effort was made to get a good pinpoint on the Lourenço Marques coastline. I was told that Tulear, on the south-west coast of Madagascar, sometimes produces a dubious radio fix. Nearing Johannesburg, Carolina Beacon was the main aid for arrival on schedule.

The last lap of our flight was without incident or weather disturbance and we touched down on a beautiful bright morning at Jan Smuts airport, Johannesburg, after eight hours in the air. Formalities have been much speeded up and simplified since my previous visit to the city (through Palmietfontein airport) although the preparatory form filling for entry into the Union of South Africa occupied some time in the aircraft after breakfast had been served. The final printed instruction on the form sounded ominous. It read "This form must be completed without delay and will be collected before the train reaches Mafeking."

With an eye on the future we conclude with this fine aerial of one of Q.E.A.'s new Super Constellations. This type has already been introduced on the Pacific route and is likely to be flown on the Indian Ocean service in the not-too-distant future.

MIDGET BOMBER: An informative view of the Douglas A4D Skyhawk carrier-borne attack aircraft, powered by a Wright J65. Note the subtle shaping of the intakes and the pilot's good field of view over the nose.

AIRCRAFT INTELLIGENCE

Canada

de Havilland Canada-built Grumman S2Fs. The likelihood is reported in America that the initial order for these twin-engined submarine hunter/killers (25 for the Royal Canadian Navy) will be increased to between 100 and 250 machines for N.A.T.O. countries.

Canadair Orenda-Sabre. Speaking in New York recently, Air Marshal J. L. Plant R.C.A.F. said that the Orenda made the Sabre 5 "the best Sabre in the world". Although it was not quite as fast as the F-100, it had no equal as a day intercepter at high levels and was better than American Sabres. The Avon Sabre was not mentioned.

U.S.A.

Lightweight Fighters. With a view to future procurement the U.S.A.F. will evaluate four new "lightweight" fighter proposals next month. They are the Lockheed XF-104, Northrop Fang, North American Guppy, and a Republic project.

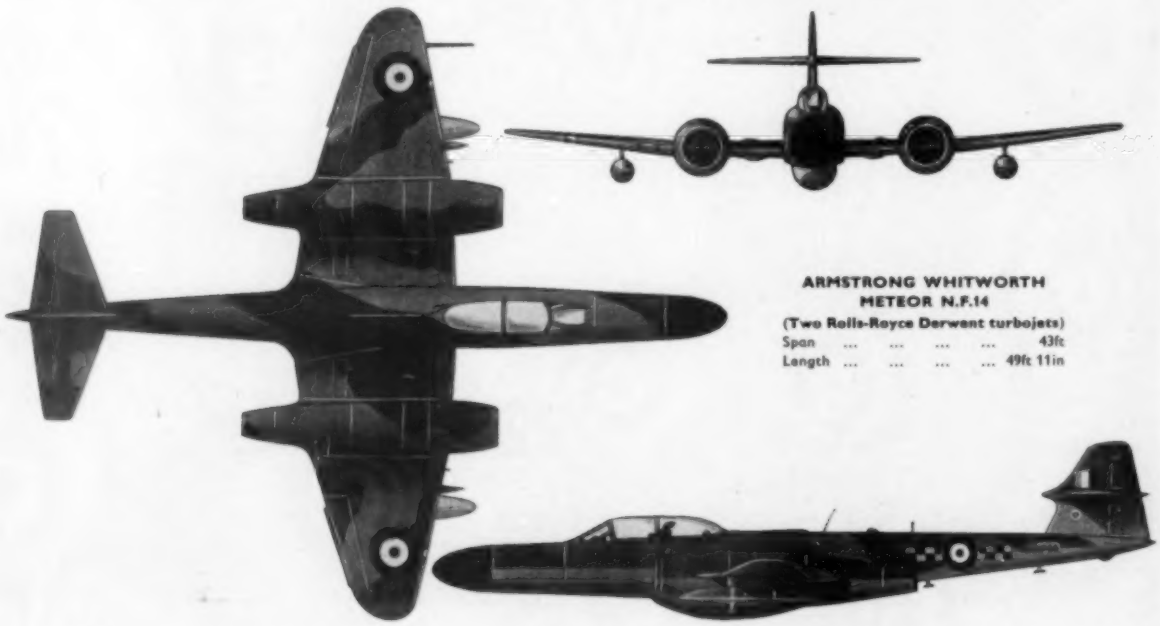
Bell X-2. The second example of this swept-wing, stainless-steel, supersonic research aircraft has already been fitted with its Curtiss-Wright rocket, of 12,000 lb thrust, and is being prepared for test at Bell's Wheatfield, New York, factory. The first specimen was destroyed when it exploded while being carried by a B-29.

Douglas DC-7C. Fifteen of these developed DC-7Bs are the subject of a $33 million order from Pan American World Airways. The span, at 127ft 6in, is 10ft greater than that of the -7 and 7B, and the fin and rudder have been heightened about 2ft. The engines will be the BA-4 model of the Wright R-3350 Turbo-Compound, providing a power increase of about 20 per cent, and the inboard units will be 5ft further out from the fuselage, allowing a 70in clearance between the airscrew tips and the fuselage side. This is expected to result in a noise level of the order of that in the DC-6B. (The DC-7 has been criticized on the score of cabin noise.) Fuel capacity will be increased from 6,400 U.S. gallons in the DC-7B to 7,860 U.S. gallons, giving a range of over 5,000 miles, with a reserve of 1,200 gallons. For that range up to 50 passengers will be carried, in addition to baggage, cargo and mail. Take-off and landing weights are 140,000 lb and 107,000 lb respectively.

Rocket-propelled Helicopters. Two new types of single-seat, rocket-propelled helicopters have recently flown. They are the Rotor-Craft RH-1 Pinwheel and the Kellett KH-15, nicknamed Stable Mabel. The first tethered flight of the RH-1 was made last year. It has a four-point fixed undercarriage and Reaction Motors, Inc. rocket units of about 16 lb thrust apiece at the rotor tips. The KH-15 likewise has Reaction Motors rockets (hydrogen peroxide), and a conventional, variable-pitch, tail rotor for directional control. The designs of these new helicopters were initiated by the Office of Naval Research and continued under the sponsorship of the Bureau of Aeronautics. The Transportation Corps of the U.S. Army were also concerned in the Rotor-Craft project.

France

Sipa 200 Minijet. An Argentine pilot of the Saptalan company has spent several days in France studying this light jet-propelled two-seater. After making six flights—two of them solo—he placed an order for one machine, to be delivered to Argentina, with spares, during September. Acceptance flights of this aircraft will begin early in August, and thereafter a "pre-series" of five Minijets—for unspecified customers—will be completed at the rate of one a month.



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THE FORMULA FOR SUPERSONIC FLIGHT

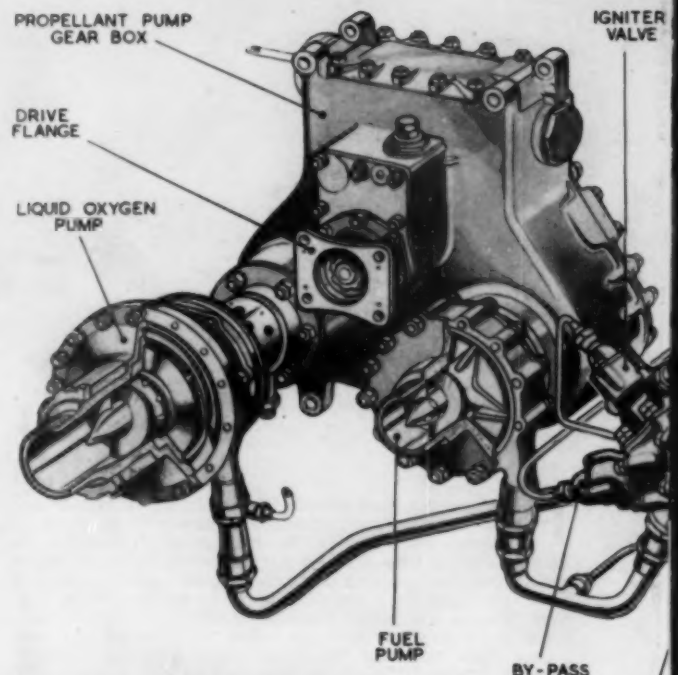
GYRON

BOEING 707

FROM Seattle, headquarters of the Boeing Airplane Company, come these pictures of the company's prototype jet transport, the Model 367-80—more popularly known as the 707. It took off from Boeing's Renton airfield for an 84-minute maiden flight on July 15th; and subsequent tests, also made from Seattle, brought the flying time to 15 hr 46 min within eight days. During this period it reached a height of 42,000ft and a speed of 550 m.p.h. Other test details were printed last week.

One flight took the brown-and-yellow prototype close by Boeing's "trademark"—Mount Rainier, a 14,400ft peak 60 miles from Seattle. The result was the splendid portrait reproduced below.

Powered by four P. and W. J-57s of 10,000 lb thrust (the civil designation of these pod-mounted engines is JT3L), the 707 is essentially a demonstrator; at present, 3,400 lb of test equipment occupies the forward part of the cabin. The basic design is intended for service as a military transport or refueller (Stratotanker), or as an 80-130-seat airliner (Stratoliner).

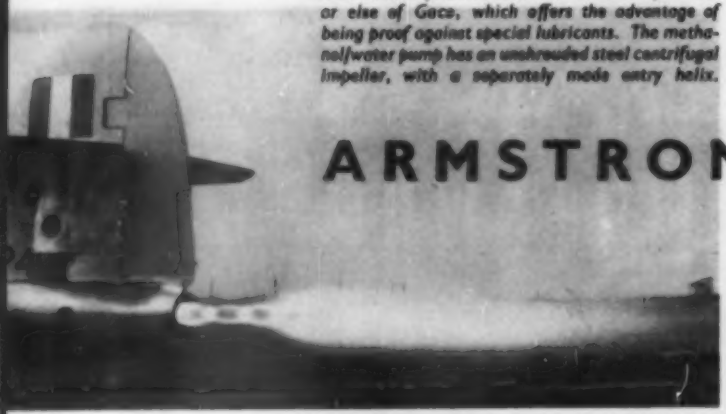


THE combustion chamber consists of an inner chamber and an outer shell. The inner chamber is a mild-steel forging, machined all over and chromium plated. The outer case is cast in aluminium alloy D.T.D.133, and is made in two portions which fit over the inner chamber. The outer case incorporates an integral scroll along which passes methanol fuel regeneratively to cool the inner chamber. A dump valve is also fitted to drain the outer chamber; normally in the open position, it is closed only by the application of full methanol pressure during firing.

The gearbox for the pumps is driven by a shaft with two universal couplings which permit limited relative movement between the box and the source of power. The drive is geared up by an epicyclic gear of about 2.7:1 ratio, the outer annulus of which is normally free to rotate, so isolating the pumps from the input shaft, the latter being driven at all times. When the pilot closes the master switch a nitrogen-operated piston clamps the band clutch, so arresting the rotation of the annulus gear and causing the pumps to rotate. The train of spur gears drives the fuel and oxidant pumps and an oil pump.

The liquid-oxygen pump has a fully shrouded centrifugal impeller, cast in phosphor-bronze and machined all over. The case is made of aluminium alloy, with inserted stainless-steel rubbing strips beside the impeller. The seals are either of leather or else of Gaco, which offers the advantage of being proof against special lubricants. The methanol/water pump has an unshrouded steel centrifugal impeller, with a separately made entry helix. Delivery pressure varies between 500 and 700 lb/sq in.

The control valves are, as far as possible, grouped into two compact banks. The valves are nitrogen-operated poppet-type units, with streamline heads and a very low pressure-drop. The valves and pistons are of light alloy, and the seats are of soft aluminium. The gas-sealing packing is of leather.



ARMSTRONG SIDDELEY SN

THE term "rocket" is applicable to any device which produces a propulsive jet by the combustion or dissociation of one or more fuels, without the combination of oxygen from the atmosphere. Although fundamentally the simplest form of propulsion unit imaginable, the rocket can assume any of a great variety of forms.

The simplest unit of all is the solid-fuel rocket of the November 5th variety, in which a rigid case is filled with a combustible mixture containing all the ingredients necessary for the production of the jet. Solid-fuel motors were made by the million for unguided missiles during the 1939-45 period, and are also manufactured for take-off-assistance installations for many types of aircraft and missiles. There is also the liquid-fuel rocket which, according to the size of tank fitted, can have variable burning time—and can also be throttled and shut down. The fuel, or fuels, can conveniently be fed into the combustion, or reaction, chamber merely by pressurizing the tanks with a supply of compressed air or inert gas.

If a rocket is required capable of acceptance for a piloted aircraft on the same basis as are the more established forms of aircraft power unit, something more refined is necessary. For example, it is preferable that the fuels should be fed by pumps; a foolproof control system is a "must"; and it is also highly desirable that the unit should have a life at least measured in hours and not minutes.

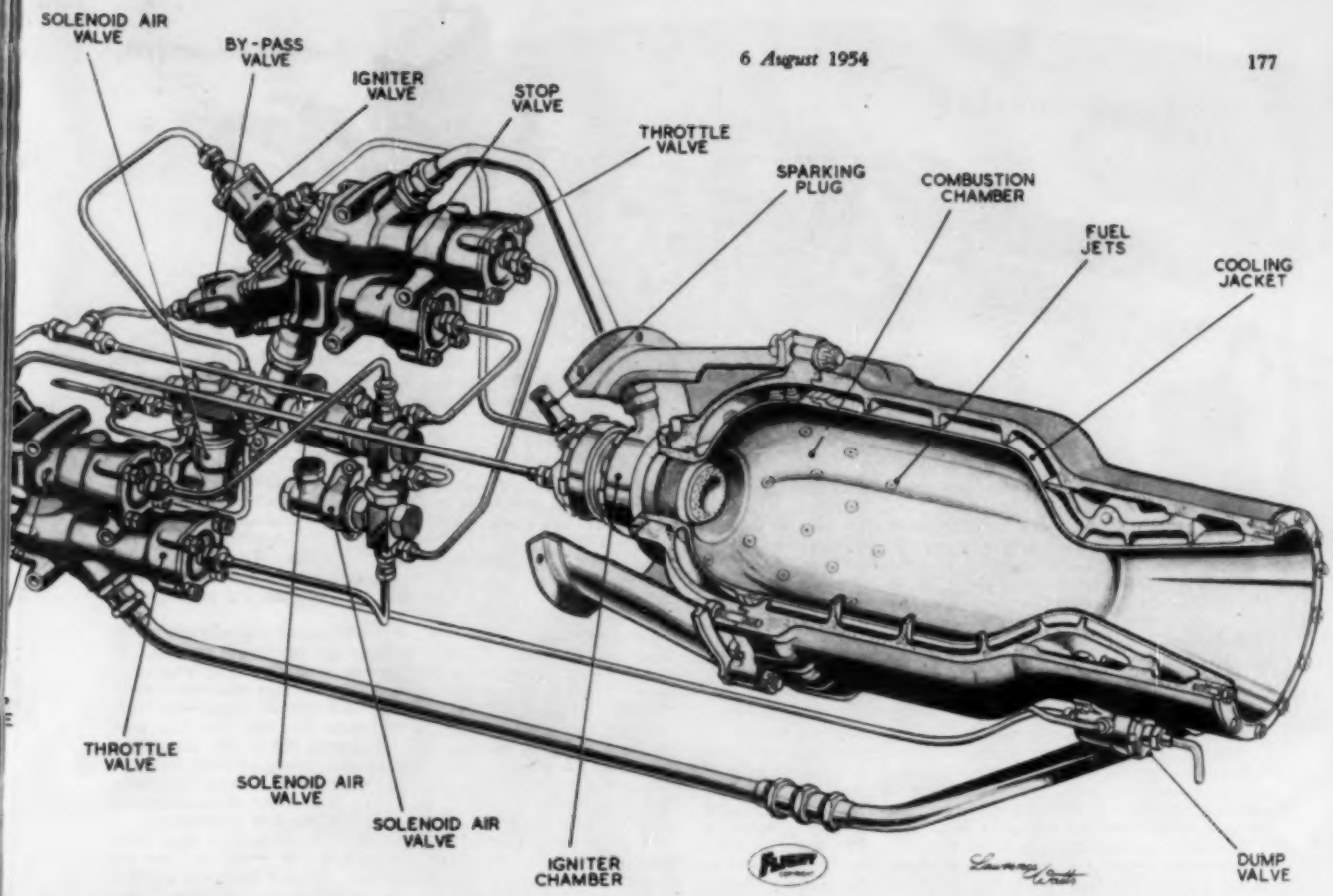
Ignoring the take-off-assistance application, for which a short-duration, expendable unit is adequate, rockets can be applied to aircraft either as boosters for limited periods when extra power is needed or else they can be the primary propulsion unit, i.e., the aircraft can be powered solely by the rocket motor. The characteristics of all rockets are such that, unlike all other forms of aero engine, they provide thrust that does not decrease with increasing altitude; in fact, it actually increases. Consequently, a rocket can provide an extremely effective booster unit where rate of climb and high-altitude performance are of paramount importance—as they are on all types of fighter aircraft. Rocket-thrust can provide valuable assistance, also, in rapidly accelerating a supersonic aircraft through the speed of sound.

Where duration is of minor consequence, there is also a case for the all-rocket fighter; but it is still too early to discuss the applications of rocket motors which are being developed in this country, and the following account must be treated simply as a chronicle of the development of the first British aircraft rocket (except, that is, for assisted take-off units), with a security veil drawn over all that has come after it.

It was in 1946 that the Ministry of Supply asked Armstrong Siddeley Motors, Ltd., of Coventry, to develop a liquid-fuel rocket motor with a thrust of 2,000 lb for use as a booster unit for fighters. The company began rocket work at the end of that year, with Mr. S. Allen, the experimental engineer in charge of all combustion research, at the head of the new team. His first two recruits were Mr. D. Hurden and Mr. H. L. G. Sunley.

From the outset, the company were working virtually from scratch. The only closely related work going on in Great Britain at that time was that undertaken by the M.o.S. itself, at the R.A.E. out-station at Westcott. The country furthest advanced in the rocket field was certainly Germany, and Mr. Sunley was, in fact, in Germany with the M.o.S. when he joined Armstrong Siddeley. When he returned, he brought with him numerous reports and selected items of research equipment. The company's engineers began by holding discussions with the R.A.E. and with any other organization who had any experience of liquid-fuel rocketry, and these early talks led to the abandonment of kerosine as the proposed hydrocarbon fuel, the eventual choice being liquid oxygen and a 65/35 per cent mixture of methyl alcohol (methanol) and water.

Gradually, the form of the new rocket began to crystallize; there was, however, nowhere that these ideas could be put to the test. The development of small combustion chambers was con-



ARLER

THE DEVELOPMENT OF A PUMP-FED LIQUID-FUEL AIRCRAFT ROCKET

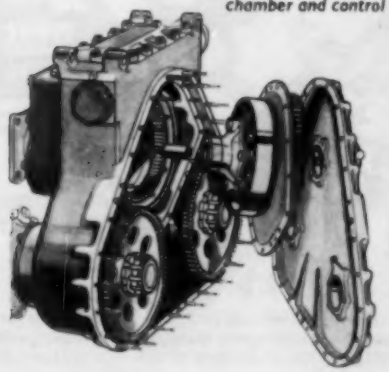
sidered as a first step, but there were then virtually no data available about scale effect; so, on balance, it appeared preferable to start off with a full-size chamber and so meet all the problems at the correct size first time. The company's subsequent experience has justified this decision.

The approximate shape and size of the chamber were worked out fairly accurately on paper before rig testing was even begun. The two great unknowns were how the fuels would be injected and how they would be ignited. One of the first rigs, therefore, consisted simply of a suitably mounted spray nozzle, together with a supply of water and a high-capacity pump. It is characteristic of the period that the only convenient pump with enough power was that on the trailer appliance of the works fire brigade, who were accordingly called out whenever a test was to be made.

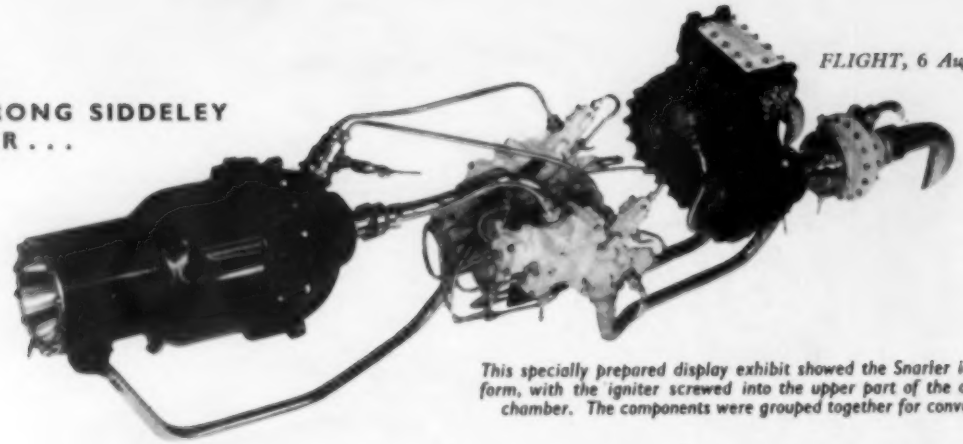
Preliminary calculations suggested that the nozzle would have to pass 60 gal/min (if both propellants were injected together) with a pressure-drop not exceeding 100 lb/sq in—say, from 400 down to 300 lb/sq in. After experiments with one pattern of two-liquid injector, a different design was developed and tested with supplies of fresh and salt water fed simultaneously by a pair of trailer pumps. The spray was caught in a honeycomb can, the amount of fluid in each cell providing an indication of the distribution and a hydrometer being used to determine the specific gravity in each cell, and hence the degree of mixing.

Investigation of ignition problems was another undertaking which could proceed without any special facilities. By the time this stage was reached, in 1947, the correct burner had been developed, and one was screwed into a "simulated" chamber consisting of a pair of metal drums, one inside the other, open at one end and with a water-cooling flow through the double wall. This apparatus, known as "the bucket," was similar to the eventual combustion chamber only in the relative positions of the burner and igniter, this geometry having been guessed—accurately—in advance. A requirement of the original specification was that the rocket should be capable of being ignited or re-ignited in the air, but the first tests were carried out with

(Left) The fuel and oxidant pumps are driven by an epicyclic gear which incorporates a band clutch. (Right) A close-up of the Snarler combustion chamber installed in the Hawker P.1072, with the access panels to the chamber and control valves removed. It will be noted that the skin was fitted quite tightly around the chamber.



ARMSTRONG SIDDELEY SNARLER . . .



This specially prepared display exhibit showed the Snarler in an early form, with the igniter screwed into the upper part of the combustion chamber. The components were grouped together for convenience.

ignition by means of a small solid charge in a steel case, screwed into the "Bucket" and fired electrically.

The rig was mounted in a sandbagged enclosure with mirror vision, control being effected from a portable box removed to the safety of a hangar. Liquid oxygen and methanol were fed under nitrogen pressure from tanks of about five gallons capacity. The feed-pipes had pressure-sensitive elements, and electric break-wires were stretched across the chamber itself, so that the light-up time could be measured electrically. Later, the same rig was used to develop the real igniter, which was virtually a miniature rocket lit by an ordinary K.L.G. sparking plug, the aim being the production of a slim pencil of flame at all altitudes. The production-type igniter, shown in the large drawing overleaf, was finally perfected in the company's rocket test house.

The erection of a proper test house was at this stage essential to further progress. The site was chosen at the company's airfield at Ansty, and the work was finished during 1947. During that year the rocket staff moved out of the main Parkside works and all rocket development has since been concentrated at Ansty.

The first test-bed is shown in the plan on p. 180, and the photograph below shows a very early combustion chamber mounted in it for a test. The bed was based on a concrete plinth and consisted of a simple iron trolley mounted on retaining rails and constrained longitudinally by a thrust-meter. A light roof was erected over the actual test-bed, and the remainder of the building was roofed with heavy reinforced concrete.

It was decided that the new motor, which had by this time been named Snarler, should be pump-fed; with the exception of the short-life German A-4 (V-2) missile, nearly all previous liquid-oxygen motors had been supplied with fuel by pressurizing the tanks, and it was soon apparent that the development of a suitable pump was going to be one of the most difficult tasks that the Snarler engineers would have to face. In fact, it seemed that, if full firing trials were delayed until the pump was ready, much valuable running time would be lost. A search for pressurized tanks was therefore instituted, and it was a very difficult matter to get tanks of the required size which could accept 400 to 500 lb/sq in. Eventually, tanks for both fuels were obtained from the British Oxygen Company, and these formed the first service tanks. The feed, by compressed nitrogen, allowed a 30-second run at about half thrust, the eventual aim being full-thrust runs of three minutes' duration.

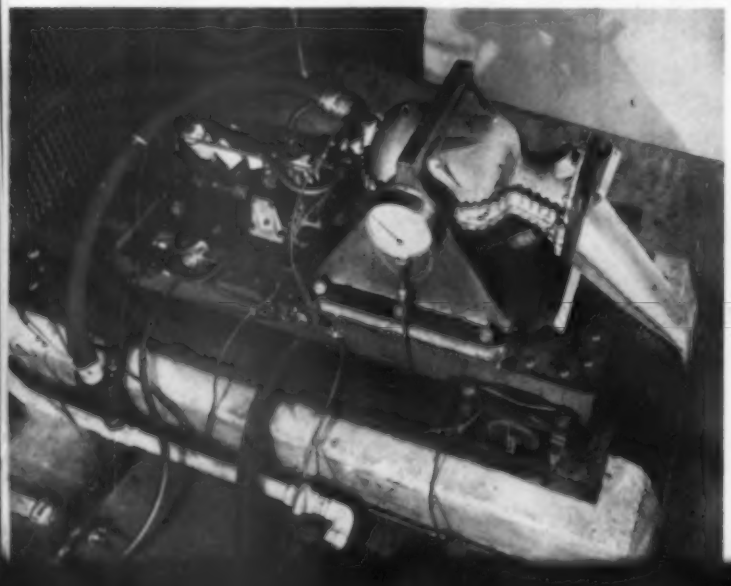
During the autumn of 1947, parts of the Snarler combustion chamber were manufactured from the initial drawings (the design being still very much on an experimental basis) and these were inspected, assembled, mounted on the test-bed and, on November 10th, 1947, fired for the first time. The initial trials were quite successful, and no mishap occurred. Incidentally, the Snarler produces a bright flame six to ten feet in length, and shock diamonds in the jet are visible in the heading photograph. The noise is intense.

Before this stage was reached the company had already made some progress in developing a pump for the liquid oxygen. It was a trying task, and the company were almost entirely on their own. The chief troubles were in the bearings and the sealing glands; the pump of the German A-4 missile employed plain bronze bearings and had a very short life, but this was permissible owing to the fact that the design life of this pump was less than two minutes. For the Snarler, a very reliable, long-life pump was required, engineered to the highest aircraft standards, and of necessity turning at high r.p.m. in order to obtain sufficient output while maintaining the smallest possible dimensions.

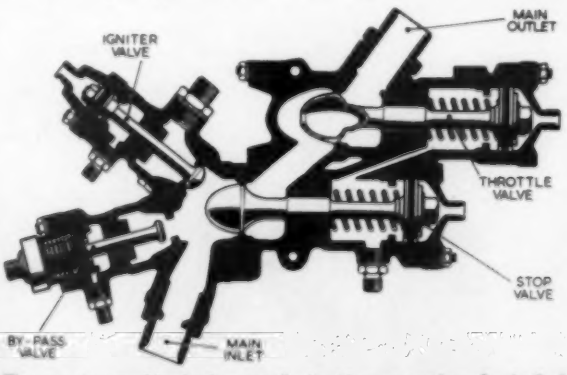
A problem arose from the fact that liquid oxygen may combine with all fatty materials or mineral oils when the two are brought into contact under pressure. Intense cold was another factor; the liquid oxygen impeller at less than −183 deg C was directly coupled to the oil-lubricated ball bearings, and the latter frequently froze during development, making torque-estimation difficult.

Unorthodox measures were therefore taken in the design of the pump. It was decided to employ an unlubricated roller bearing—made by Armstrong Siddeley—separated from lubricated ball bearings by sealing glands and slinger rings. The roller bearing, a stainless-steel assembly, acted mainly as a steady, taking only limited journal loads; most of the work was done by the lubricated ball bearings. The two glands which eventually proved adequate were quite simple rings of water-dressed beeswax leather (i.e., leather from which all natural fat was absent) axially loaded by springs.

One of the most spectacular results of the many snags encountered occurred soon after pump-running was started. The first liquid-oxygen pump was of all-aluminium construction, to save weight; it was put on an electric-motor drive and the liquid oxygen was circulated through flowmeters. After a short time, the whole pump exploded with a brilliant white flash and a dense cloud of vapour. Subsequently it was established that a bearing had failed, allowing the shaft to move axially and causing the centrifugal impeller to rub in its casing. The combination of



One of the very first Snarler development chambers is here seen mounted in the test house, which had then (November 1947) just been completed.



There are two combined valves, one for liquid oxygen and one for the fuel. Each incorporates air- (or nitrogen-) operated poppet valves, with streamlined heads; they are so designed to minimize pressure-drop.

The Alvis Leonides Helicopter Engine, a 520 b.h.p. 9-cylinder air-cooled radial engine. Weight complete 645 lb. Power/weight ratio 1·24 lb. (0·562 kg.) per b.h.p. Overall diameter 41·5 in. (105 cm.). In quantity production for the Bristol 171 and 173, also in extensive use by the Royal Navy in the Westland Dragonfly.

ALVIS

LEONIDES

ALVIS LIMITED · COVENTRY · ENGLAND

The flying-boat

NATURAL MEDIUM FOR ATOMIC PROPULSION

IN THE DEVELOPMENT *of jet engines and jet-propelled aircraft Britain has led the world. Shall we be ready to take the lead again when atomic propulsion is as real as the jet?*
That atomic power will be harnessed as a means of propulsion is now certain: many applications are already under development. It is merely a matter of time—less time probably than we think. There is another certainty too—that an atomic power plant, with its protective shield, will be far heavier than any previous system of aircraft propulsion. It is estimated that, for years to come, the minimum all-up weight of an aircraft designed for atomic propulsion will be in the region of 500,000 lb.—probably even higher.

HIGH WING-LOADING

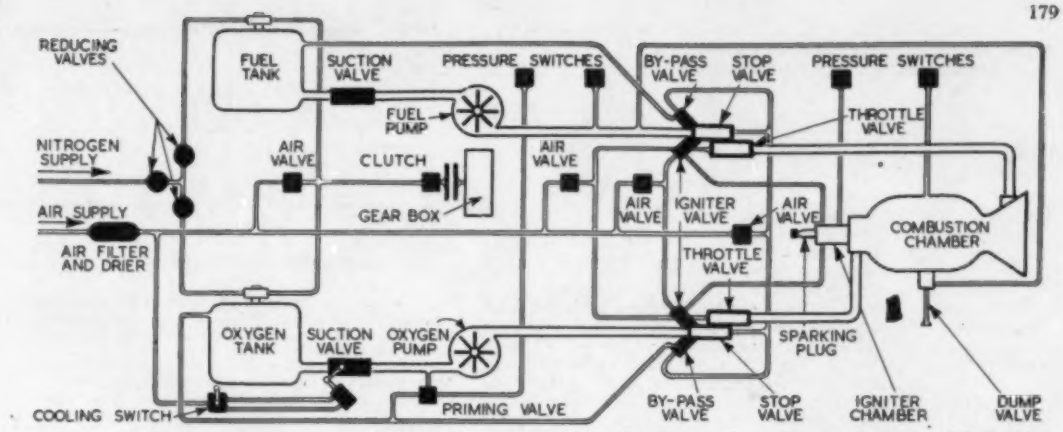
With atomic propulsion will come the advantage of almost negligible 'fuel' consumption and the corresponding disadvantage that landing weight must be a much higher proportion of take-off weight. High wing-loading at both take-off and landing is inevitable. The long landing run involved, coupled with the great size of the aircraft, puts the landplane right out of the picture. *The atomic aircraft must be a flying-boat.*
Fortunately for the future, our behind-the-scenes aerodynamic and hydrodynamic research has equipped us to design high-efficiency flying-boats of the size and characteristics required. In fact, 60% of the estimated minimum size necessary for atomic propulsion has already been achieved in the Saunders-Roe *Princess*.

PROFITABLE PRINCESS

But this fine aircraft is something more than the pattern for the large atomic flying-boats of the future. The *Princess*, outstanding in both performance and payload, can be applied to long-haul services on a new basis of economy. With its operational engines this stately flying-boat makes a highly attractive commercial proposition.
Consider what a modern flying-boat such as the *Princess* has to offer the civil (or military) operator. It is independent of the land runway—now so vulnerable and prohibitive in cost. It is the landplane's equal in speed. Its range enables it to offer minimum block times over the longest routes. On long trans-ocean stages, a flying-boat gives the air traveller greater confidence—a feeling of security that is important when 75% of the world's surface is water. And an up-to-date water-based aircraft can operate—as the *Princess* has demonstrated—from natural stretches of water such as the Solent. Its base facilities are not costly. It can make full use of every modern navigational aid that is available to the landplane.
The modern flying-boat is a paying proposition—as well as a pattern for the future.

Pattern for the atomic age—the Saunders-Roe **Princess**, *forerunner of 500,000 lb. atomic-powered flying-boats.*

An announcement by **SAUNDERS-ROE**



In purely diagrammatic form, this drawing shows the control system and fuel/oxidant supply adopted on the flight Snarler. The principle of operation is described in the text.

ARMSTRONG SIDDELEY SNARLER . . .

liquid oxygen, aluminium powder and friction heat did the rest. This was in January 1949.

Bearing trouble became so acute that each new idea was tried on a rig before being introduced to the pump itself. A plastic bearing was considered at one stage, with a filling mainly of asbestos; it failed rapidly, and the heat generated sheared the heavy steel shaft clean across. However, the metal-explosion trouble was eventually cured by making the impeller of bronze and running it in a case faced with thin discs of stainless steel. These inert materials proved quite compatible, as was established when the redesigned pump was stripped after an actual firing; the bearing had failed early and had disappeared completely, all journal loads thereafter being taken by the impeller.

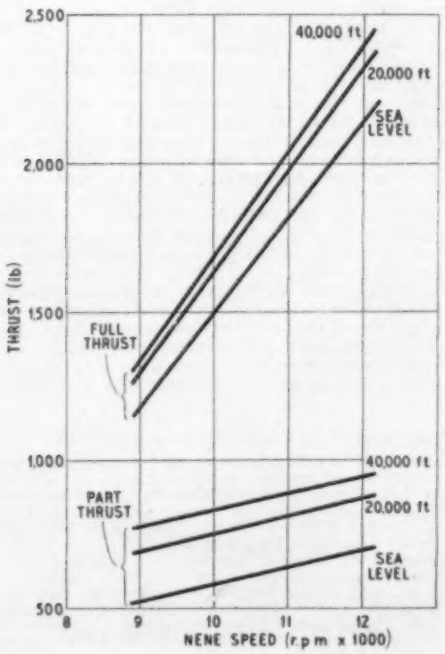
The next milestone was the first genuine run of the rocket with the fuel pump, the date being February 23rd, 1949. The nucleus of the eventual Snarler aircraft rocket had then been developed, and most of the remaining work centred on the control system.

At this point, it is worth noting that a liquid-fuel rocket is (like a gas turbine) capable of being broken down into basic components, each of which can be developed on its own and matched to the remainder to form the whole, and the final aircraft installation is extremely flexible as a result. For example, so long as the combustion chamber is put somewhere at the tail of the aircraft the remaining units can be disposed in any convenient part of the airframe. It is, therefore, practically impossible to illustrate an actual rocket motor installation of this type, and neither can the company show one for display purposes; the best that can be done is to group all the components into a compact mass, and this has been done by Armstrong Siddeley with their display Snarler, and by our artist (p. 176-177).

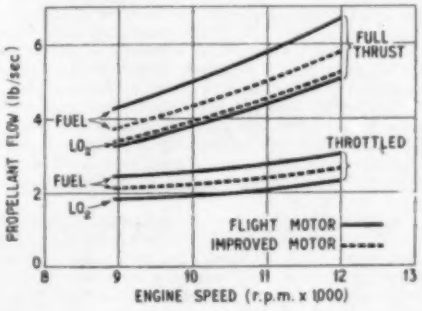
During all the development trials of the combustion chamber, ignition system and pumps, separate switches had been used for each control service. For an aircraft installation, a total of two control switches, or levers, was considered to be the acceptable maximum. Primarily, the system has to ensure that, in the starting cycle, nothing can happen unless the preceding operation has been completed. How this can be achieved can be seen quite readily, each part of the system being fitted with a pressure-sensitive switch which triggers the electrical circuit to open the valve for the next part of the starting cycle.

The starting cycle is preceded (in an aircraft installation) by the pilot opening the liquid oxygen suction valve—if convenient, this can be done while the lox* tank is still being filled, so reducing loss by evaporation. Opening this valve permits lox to circulate, under gravity, from the tank to the pump, through the centrifugal impeller, to a by-pass valve near the combustion chamber, and then back to the tank. After a short period the whole lox system is cooled down almost to the temperature of the fluid, a fact rendered obvious by the appearance of frost on the lagged pipes. If this were not done, the blue-tinted fluid would

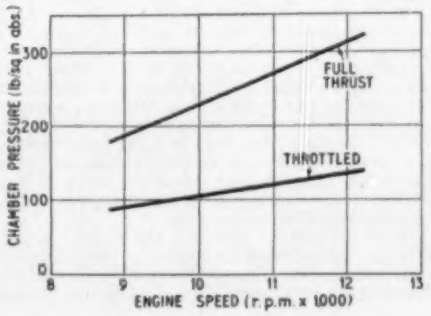
* *This is a convenient American abbreviation; some firms use "LO_2"*

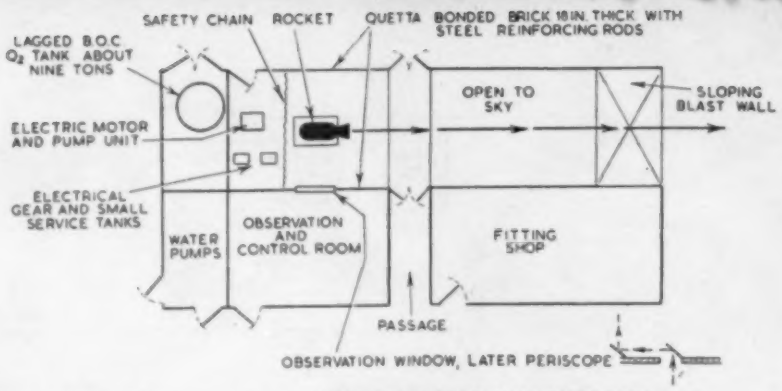


(Left) Variation of thrust of the flight Snarler with pump speed and altitude.



On the right is shown variation of propellant consumption and combustion chamber pressure with pump speed. In the upper drawing the "LO_2" symbol is used for liquid oxygen.





Layout of A.S.M.'s first rocket test house, since supplemented by a larger installation.

ARMSTRONG SIDDELEY SNARLER . . .

evaporate in the supply pipes and cause vapour locks; even with the suction valve open a second by-pass is needed on the pump to prevent a vapour lock in the pump itself.

When the lox tank is full and the supply lines cold, the pilot operates the master switch, which causes bottled nitrogen to pressurize the tanks for both liquid oxygen and methanol, and also engages the clutch in the drive to the pumps. (Here it may be remarked that in the only Snarler installation actually flown, described below, the pumps were driven by a turbojet; but it is equally possible to have a self-contained pump-drive running on the rocket fuels.) When the lox pump primes, the delivery-pipe pressure rises—the fluid being pumped back to the tank—until the pressure is sufficient to close a pressure-sensitive switch which opens the fuel suction valve.

When both fuel-delivery lines are at the appropriate pressure the two igniter valves open and the booster coil is energized. The propellants mix in the pre-combustion chamber, are ignited by the sparking plug, and the resultant increase in pressure is made to open the main stop valves and shut the by-passes. This gives one-third thrust (about 700 lb in the case of the Snarler) and is obtained with the main cockpit lever (a three-position switch) in the "partial thrust" position. When the switch is moved to the final "full thrust" position, the throttle valves are opened fully and the igniter valves are simultaneously closed to prevent the sparking plug from overheating.

The time taken to reach full thrust from rest varies according to the installation, but in the Hawker P.1072 (referred to later) the period was about eight seconds.

The pilot also has an emergency button on his control column which, when pressed, vents the nitrogen system and shuts down the complete rocket fuel system, so that combustion is rapidly brought to a halt. To re-start the motor the master switch has then to be placed in the "off" position in order to release the emergency-button relay. As an added precaution, all the control valves are designed to fail safe.

The Snarler was first started and run on its complete control system on March 29th, 1950. At this date it was, therefore, almost a complete power unit, and the next step was to get it into the air. First, however, the new rocket motor had to undergo a Ministry of Supply special category test designed to ensure that the unit had sufficient life and reliability, and this took the form of a large number of firings, on some of which the tanks were allowed to run dry. The test actually run included 24 firings and 74 pump-clutch engagements, the total firing time being 71 minutes at full thrust and 15½ minutes at one-third thrust. This was successfully completed in May 1950.

The aircraft selected for testing the Snarler was the Hawker P.1040 prototype (forerunner of the Sea Hawk), serialled VP 401. During the summer of 1950 the Hawker company installed a flight-cleared Snarler in the extreme tail, this process being facilitated by the fact that the Rolls-Royce Nene turbojet had a bifurcated jet-pipe exhausting at each trailing-edge wing root. Close co-operation was maintained with Armstrong Siddeley throughout, both companies being members of the Hawker Siddeley Group.

Behind the pilot, a fuel tank was replaced by an 80-gallon liquid-oxygen tank made of light alloy lagged with a half-inch glass-wool layer encased in doped fabric. Just forward of the Nene the pump and accessory bay was re-arranged to accommodate—with some persuasion—the rocket pumps, with their 70 h.p. Hardy Spicer drive, and the 1,800 lb/sq in wire-wound nitrogen bottles, pipes and valves, as well as an automatic observer recording flight and rocket data. At the rear of the Nene, the tank between the jet pipes was converted to accommodate 115 gallons of methanol, with the feed pipes running forward to the pumps ahead of the Nene and finally back to the rocket in the tail. All the main supply piping was, through considerations of space and accessibility, accommodated outside the belly skin of the aircraft, in a keel fairing. All the real "works" of the rocket were in a bay immediately forward of the combustion chamber, with the switches and solenoids centrally positioned and the fuel valves on either side. The chamber itself was attached to a sheet mounting-cone riveted to a circular rear-fuselage frame.

With the Snarler installed, the aircraft became the Hawker P.1072, and it began its trials on November 20th, 1950, in the hands of the late Trevor Wade, then Hawkers' chief test pilot. Based at the Armstrong Siddeley airfield at Bitteswell, it made six flights, each with about two to two-and-a-half minutes' burning time. The Mach limitation of the airframe was such that the Snarler could be fired only during a steep climb—and, as it was unpressurized, flying was restricted to altitudes below about 30,000ft. The present Hawker chief test pilot, Neville Duke, did some of this work.

The initial flight of the P.1072 was the first ascent by any pump-fed liquid-oxygen rocket in a piloted aircraft. The day was dull and overcast, and the P.1072 could be heard only distantly through dense cloud. Those on Bitteswell airfield were quite ignorant of whether Wade had fired the rocket or not, and were still waiting expectantly when the fighter appeared low down at full power. Passing overhead, Wade did a smart roll; all had gone well. Incidentally, the Snarler is fully aerobatic.

Experience with the P.1072, and other developments, have now taught Armstrong Siddeley a great deal about rockets for piloted fighters. It has been found, for example, that an aircraft with such a motor can be held at readiness with the tanks filled, and that—if they are carefully designed—the valves do not freeze up. There is no objection to siting the lox and hydrocarbon tanks close to each other, and the obvious aim (whether it has been achieved or not cannot yet be stated) is to run the rocket on lox and turbine fuel. The latter is nothing like so good a chamber coolant as is water/methanol, but it gives a rather higher specific impulse, and, of course, permits a much simpler fuel system and eases the logistic problems. The all-rocket fighter has not been neglected, and it has been found that such a machine is quite practicable; fuel and oxidant pumps, and the aircraft accessories, would be driven by a turbine supplied from a gas generator running on the main propellants.

It was, however, the P.1072 which first showed what could be done. On the strength of its performance, Armstrong Siddeley were given a great deal of other rocket work to do, and this will make good reading when details can be published.

At the beginning of this year, the company (in conjunction with the parent Hawker Siddeley Group) decided that there was a big future for rocketry, and the new Armstrong Siddeley Rocket Division was formed, with headquarters at Ansty. Mr. Allen is chief engineer of the division, and Mr. E. G. D. Andrews is chief designer. The old Snarler test-bed has since been supplemented by a much larger bed—which is in use—and a smaller bed is being added to handle auxiliaries and small, potentially dangerous items. A large laboratory is also being fitted out to investigate associated problems.

The Rocket Division have an expansion programme planned up to the end of 1956, and some indication of its scope is given by the fact that the size of the staff is scheduled to be doubled by the end of this year. Armstrong Siddeley have laid the foundations with a small, enthusiastic team—the future rests squarely on the output from British technical colleges and universities.

W.T.G.

ARMSTRONG SIDDELEY SNARLER DATA

Fuels: liquid oxygen (specific gravity, 1.138; boiling point at sea level—183 deg C) and a mixture of 35 per cent water and 65 per cent methyl alcohol by weight (specific gravity, 0.886).

Dimensions: chamber length, 25.4in to end of mounting cone; nozzle diameter, 9.41in; throat area, 5.21 sq in; characteristic length, 94in.

Weight: gearbox, drive and pumps, about 77 lb; valves, filters, bottles and electric gear, about 57 lb; chamber and mounting, igniter, valves and electrical gear, about 79 lb; total, approximately 213 lb. Note: according to the S.B.A.C. definition of a motor the Snarler's dry weight would be about 166 lb.

Performance: thrust and consumption figures are obtainable from the curves on page 179. Specific impulse, 195 maximum at sea level; maximum combustion chamber pressure, 300 lb/sq in; maximum combustion temperature, approximately 2,650 deg K; jet velocity, 6,270ft/sec.

CONTRIBUTORS TO THE SNARLER

Armstrong Siddeley Motors, Ltd., have provided the following list of firms providing materials, fittings, etc., for the Snarler:—

George Angus, Ltd., Automotive Engineering Co., Ltd., The British Oxygen Co., Ltd., Dependable Springs and Pressings, Ltd., Dowty Equipment, Ltd., Dunlop Rubber Co., Ltd., Ferodo, Ltd., Fibreglass, Ltd., Flexo Plywood Industries, Ltd., Fozel Castings, Ltd., Imperial Chemical Industries, Ltd., Johnson, Matthey, Ltd., K.L.G. Sparking Plugs, Ltd., Richard Klinger, Ltd., Nobes and Hunt, Ltd., Ransome and Marles Bearing Co., Ltd., Rotax, Ltd., George Salter and Co., Ltd., Saunders Valve Co., Ltd., Super Oil Seals and Gaskets, Ltd., Teddington Controls, Ltd., Tufnol Ltd., Charles Weston and Co., Ltd.

JET PROVOST PERFORMANCE

—*and Some Design Considerations*

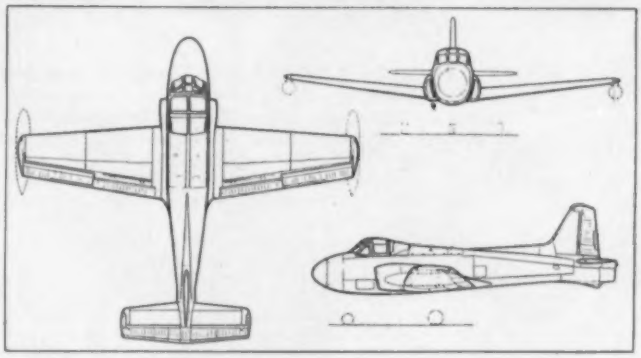
The prototype of the Hunting Percival Jet Provost T.1 photographed recently at Luton. Initial flight trials have enabled the makers to issue the performance data on this page.

THE standard of performance achieved by the Hunting Percival Jet Provost T.1 trainer, with its Armstrong Siddeley Viper ASV.5 turbojet, has for some time been a matter for conjecture. Now the makers have released the particulars tabulated on this page, which show the aircraft to have a top speed of 281 kt at 20,000ft, a sea-level rate of climb of over 2,500ft/min, and a take-off ground run of only 410 yd. Other data provided by the makers show that, at 10,000ft and at a true air speed of 117 kt, a range of 325 nautical miles and an endurance of 2.75 hr are attainable when carrying tip tanks (i.e., at a gross weight of 6,750 lb). At 20,000ft the corresponding figures are 137 kt, 428 nautical miles, and 3.06 hr.

The makers maintain that the essential difference between the new trainer and other jet-powered machines for similar work is that, whereas the latter are designed with the primary object of obtaining the maximum possible performance afforded by the selected power plant, the Jet Provost aims at retaining, in the largest possible measure, the safe handling characteristics necessary for initial training, with performance as a secondary consideration. In selecting the power plant their major considerations were to provide a take-off run which would permit the continued use of present training airfields, without calling for runway extensions, and give a fuel consumption which would enable the sortie-duration of the current training syllabus to be flown with comfortable reserves.

The R.A.F., it is pointed out, having proved the practicability of training its pilots on only two types (piston-engined Provost and jet-propelled Vampire), will only accept a change from this arrangement provided it can still allow of the syllabus being completed on two types. Few air forces, it is suggested, will be entirely jet-equipped, and the necessity for training pupils in piston-engined aircraft, or of converting them, must still exist. In these cases the establishment of a number of piston-engined Provosts would provide such training or conversion in a school already equipped with the jet variant.

It is claimed that, making all due allowances for initial first cost of aircraft, upkeep of airfields, unit equipment, maintenance and overhaul costs, spares backings, etc., the Jet Provost can be operated at £61 per flying hour, whereas an advanced trainer (of unspecified type) costs £161 per flying hour. These figures are based on 30-week instructional courses covering 120 hours' flying on each aircraft. In the opinion of certain training staff officers at least 30 hours of the advanced stage syllabus can be handled by the Jet Provost, resulting in a saving of £3,000 per pupil on flying costs alone. Remembering a recent Parliamentary answer, in which it was stated that to train a bomber pilot now costs something like £25,000, such an economy is of considerable significance.



HUNTING PERCIVAL JET PROVOST T Mk 1

(Armstrong Siddeley Viper ASV.5 of 1,750 lb static thrust)

Dimensions and Areas

Span	35ft 5in
Length	31ft 11in
Height	12ft 8in
Tailplane span	13ft 6in
Wheel track	10ft 1.4in
Wheel base	9ft 9.5in
Mainplane (gross)	213.70 sq ft
Mainplane (net)	181.30 sq ft

Performance

The following estimated performance figures are based on maximum take-off weights as shown below and data available up to July 1st, 1954.

	Case 1 above	Case 2 above
All-up weight at take-off:—		
Full internal fuel, tip tanks fitted		5,950 lb
Maximum fuel load, tip tanks full		6,750 lb
Maximum level speeds:—		
At sea level	263 kt	261 kt
At 10,000ft	272 kt	268 kt
At 20,000ft	281 kt	277 kt
At 30,000ft	276 kt	267 kt
Rates of climb (13,400 r.p.m.):—		
At sea level	2,520ft/min	2,130ft/min
At 10,000ft	1,920ft/min	1,600ft/min
At 20,000ft	1,375ft/min	1,055ft/min
At 30,000ft	720ft/min	440ft/min
Times to height:—		
Sea level to 10,000ft	4.5 min	5.5 min
Sea level to 20,000ft	11.9 min	15.0 min
Sea level to 30,000ft	24.4 min	35.0 min
Ceiling:—		
At maximum climb power (13,100 r.p.m.) for a rate of climb of 400ft/min	31,000ft	27,500ft
Stalling speed:—		
Undercarriage and flaps down	66 kt	71 kt
Take-off distance (at sea level, in still air—I.S.A.):—		
Ground run	410 yd	550 yd
Total distance to 50ft	665 yd	820 yd
Landing distance (at sea level, in still air—I.S.A.):—		
Total distance from 50ft	670 yd	740 yd
Ground run	380 yd	450 yd

AVIATION MEDICINE IN AUSTRALIA

TO further the science and application of aviation medicine in Australia, an aero-medical laboratory has been established within the Department of Physiology at the University of Adelaide.

The Director of Aviation Medicine of the Department of Civil Aviation, Dr. J. C. Lane, has explained that the new laboratory will be financed jointly by the Royal Australian Air Force and the Department of Civil Aviation. It will provide for development and test work in applied physiology in aviation. The first stage will be to provide physiological-test facilities for personnel-equipment, such as oxygen masks, oxygen regulators and pressure suits. A decompression chamber owned by the R.A.A.F. has already been installed in the laboratory.

The Services and organizations to be served by the new establishment will include the Royal Australian Air Force and Navy, Department of Civil Aviation, airline operators, the Government aircraft factories, Commonwealth Corporation and de Havilland Aircraft Pty., Ltd.

The head of the Physiology Department at the University of Adelaide is Professor Sir Stanton Hicks, and Dr. D. H. LeMessurier is officer in charge of the new laboratory.

The S.N.C.A.S.E. Baroudeur 02 at rest on its take-off trolley at Istres. Note the detachable fin/skids.

THE BAROUDEURS ADVANCE

Progress with France's Trolley-launched, Skid-landing Single-seaters

SINCE the S.N.C.A.S.E. S.E.5000 Baroudeur was first described in *Flight* a little over a year ago a considerable amount of testing and experiment has been completed. Prototype 01 made its first flight on August 1st, 1953, and 02 on May 12th, 1954; by the end of June about 100 hours had been flown by the two. Achievement of supersonic speed in a dive—by the 02—was recorded in *Flight* last week.

Because of the unconventional landing gear of the Baroudeur the flight-test schedule took an unusual form. The principal programme was to prove to the Ministère de l'Air that the landing gear would work, since, it will be recalled, the Baroudeur was a private venture, built at S.N.C.A.S.E.'s own cost under the personal direction of its President, M. Georges Hereil. In order to recoup the expenditure on the two prototypes and, if possible, to secure a production order, a decidedly doubtful Air Force had to be convinced. To do this it was necessary to fly the first prototype from several sorts of terrain, as might be met in any part of the world.

Here it may be of interest to note that the S.N.C.A.S.E. has a rigid pre-flight test schedule. This consists of a series of 80 cycles, each representing an imaginary flight that must be completed without a single failure. A fault, even in the last cycle, means starting the series again from the beginning—which explains why the maiden flights of both the first and second Baroudeurs were delayed some weeks after the machines were apparently complete. The cycle consists of take-off actions, a certain number of control movements, representing an operational flight, and the landing drill. Power is, of course, supplied from an external source, since the engine is not running, but brakes, flaps, undercarriage, flying-control boosters, etc., are fully exercised.

During last summer and autumn the first Baroudeur was proved to the general satisfaction of the company and of its designer, Mr. W. J. Jakimiuk.* The practicability of the trolley take-off and skid landings were proved. Differential brakes on the trolley wheels made the take-off simple and, even without rockets, the distance was reasonable. For landing, the Baroudeur is brought down first on the tail skid and is then allowed to sink on to the main skids, when, because of ground friction, it runs straight to a stop. Even a crosswind component of twelve knots did not affect the run during early trials. Differentially controlled claws on the main skids can be used to assist steering on ice or slippery ground.

When the strictly designed drill had been proved other take-off tests were made. These included take-off without the trolley from grass, P.S.P. tracking, and greased runway. Without the trolley drag and weight, the run was actually shorter, although considerable power was required to overcome initial friction. To meet further suggestions that the Baroudeur would be immobile without its trolley, take-offs were made with it still attached. Using some flap it is possible to carry the trolley for 100 miles at a speed of 190 kt.

Ground handling tests were aimed at proving that the Baroudeur would not suffer from the Me 163's trouble of immobility without its trolley and truck. The S.N.C.A.S.E. test pilot in charge, M. Pierre Maulandi, was able to show that he could taxi on skids, and could turn on a 70ft radius to an accuracy of one yard. In other words, he has no need to wait for the trolley, but taxies over to it, is winched up by the Jeep, and then can taxi as in an ordinary aeroplane—with the difference that the trolley's low-pressure tyres do not sink into soft grass. The actual time taken to haul the machine on to the trolley is just under two minutes.

It was December by the time all these trials had been carried out; so the Baroudeur was launched on its first official series of tests at the worst time of year. This meant that success, if achieved, would be all the more convincing. The take-off and landing trials on the stony soil of Istres were supplemented by a series on firm grass at Toulouse-Blagnac, and by others on heavy clay at Mélun-Villaroche (near Paris), on the wet sand at La Baule, and in swampy ground at Tours. In the last-named place the Baroudeur

* *Mr. Jakimiuk was a technician of the pre-war P.Z.L. factory of Warsaw and was the designer of the D.H. Canada Chipmunk and Beaver, and adapter of the Vampire Night Fighter.*

(Left) The 02 over the old harbour, Marseilles. Only the mounting strakes for the fin/skids remain. (Right) The 01 taking off with its trolley attached.

S.N.C.A.S.E. BAROUDEUR

Dimensions:—	
Span	32ft 10in
Length, overall	44ft 3in
Height, skids	10ft 0in
,, on dolly	11ft 9in
Wing area	272 sq ft
Aspect ratio	4
Sweepback, on quarter chord	35 deg
Weights:—	
Empty	9,850 lb
Gross, normal	15,256 lb
Overload	20,018 lb
Combat weight	13,514 lb
Miscellaneous:—	
Trolley tyre pressure	35 lb/sq in
Skid contact pressure	14 lb/sq in
Estimated Performance:— (S.N.E.C.M.A. Atar 101-E, 7,280 lb. static thrust)	
Speed, sea level	616 kt
,, 20,000ft	608 kt
,, 49,000ft	546 kt
Climb, sea level	10,500ft/min
,, 20,000ft	7,400ft/min
,, 49,000ft	870ft/min
Ceiling, absolute	51,000ft

performed successfully, but the Dodge van sent to mount it on the trolley was bogged down.

Completion of these tests was acknowledged by an order for five pre-production machines, to be followed by a small series.

It might be wondered why no mention of take-off rockets has been made, since these were an essential part of the technique originally conceived. On a small-quantity basis the rockets are expensive—they would have cost about £40 per take-off; so, since the Baroudeur was getting into the air quite successfully without them, they were not used until May 28th this year, when proving trials using both two and four boosters were carried out.

So much for the take-off and landing trials. General flight and performance tests were carried out later and are, in fact, still proceeding. M. Maulandi is continuing at Istres with the O2, while M. Piere Nadot, S.N.C.A.S.E. chief test pilot, is now testing the O1 at Toulouse-Blagnac, to which he flew it from Istres (180) in 17 min on July 5th.

General handling and performance of the Baroudeur have, according to S.N.C.A.S.E., been up to expectation. It has, however, had its share of that current ailment, dutch roll. It is a pretty open secret that most highly swept aeroplanes—and particularly those with lateral intakes—can suffer from high-frequency oscillations in yaw and roll under conditions of low damping, i.e., at low speed or very high altitude.

It will be noted that the Baroudeur had two under-fins added during the winter and that the O2 has much greater anhedral than the O1. Both these features can help to damp out yaw-and-roll oscillations—in fact, one understands that the O2 compares well with other contemporary fighters in this respect. Another use for the under-fins was as a possible replacement for the retractable tail-skid; they were therefore resiliently mounted and shod with steel. On the O2 the fins are detachable, the fuselage being fitted with two mounting strakes.

The thin wing (8 per cent) is fitted with automatic slats and these were subject to a very careful flight-test programme. The first flights were made with the slats locked open, then the slats were locked shut and fences were fitted at a flow-separation point. Most of the landing tests were done in this condition and it was not until this spring that the slats were released in stages. All sections are now free and the fences have been removed. Since the O2 has fences, the slats have probably been locked and the programme is being repeated because of the increased anhedral.

The O1 underwent some modifications in fin and rudder area and in the O2 these have been cleaned up. A modification which is not externally obvious is that the O2 has the necessary fittings for British Flight Refuelling equipment. Although a nose probe is not at present mounted there is provision for one, and it will be installed at a later stage in the trials. There are also fittings for four 700-litre wing drop tanks.

The unusual sharp-lipped engine air intakes, designed for high speed, have, even to Mr. Jakimiuk's surprise, proved no hindrance to static or take-off thrust. In theory, such lips can cause boundary-layer separation at low speed, with consequent turbulence and the danger of surging or compressor stall.

A remark of M. Maulandi's is worth quoting. He says that, for him, the Baroudeur has taken the worry out of jet flying. No longer does he have to start calculating where he could put down in the event of an engine failure as soon as he takes off; now he knows he can land in any reasonably large field.

There have been two recent rumours about the Baroudeur, one correct and the other not. It is true that a lightened and simplified design was submitted to NATO for the light fighter requirement. It is not true that there are plans for a Baroudeur with a conventional alighting gear; there is a projected undercarriage modification, but it is unconventional.

J. S.

One of the landings on the beach at La Baule. In addition to the final part of the skid-marks, the tracks of the take-off trolley can be seen.

Tours, where the Baroudeur landed successfully on boggy ground.

Preparing to mount the Baroudeur on its trolley. The power take-off pulls the aircraft up over rollers, the trolley being held by the rigid tow-bar.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Opportunity Missed

YOUR feature on the Russian civil airline system [July 23rd] was all the more fascinating because it confirmed what many people believed. However, it also gives point to the arrival of 30 Russian students in this country in a Viking. These students changed aircraft at Prague with 30 U.K. students, who flew on to Russia in a Russian aircraft.

Why a Viking? Wasn't this a fine opportunity for the West to show the students something of higher Western standards in air transport? At least a Hermes, which is pressurized and four-engined, might have been supplied by the charter company responsible for the operation. One would not expect a national effort to be made with a B.E.A. Viscount, but at least something more up-to-date than a Viking, which is on a par with their own types.

Seriously, why cannot some modern types be used whenever transport contact with Russia or Russians is made, just as another piece of the general reminder that our standards are higher? I note with pain, in the newsreel of the recent Geneva Conference, that M. Mendes-France arrived in the same type as Mr. Molotov —a Dakota.

London, S.W.3. STANLEY BROGDEN.

"Afterburning" and "Re-heat"

IS it too late to plead, through your columns, for standardization of the term used to describe thrust-augmentation by burning fuel in the jet pipe? At the present time, two terms are used synonymously; an example is afforded by your excellent leader for July 23rd, in which the subject is introduced by the term "afterburning" and is subsequently referred to, not only in the same paragraph but actually in the same sentence, as "reheat."

The term "reheat" may have historical priority, at least in British usage, but it is also the generally accepted term for another process, namely, the re-heating of the gases during their passage from one turbine to another in a multi-turbine installation. Even if inter-turbine reheat is at present used only in complex non-aero gas-turbine installations, its future use in compound turboprop engines is a possibility; in fact, proposals for such use may be found in several Power Jets patent specifications. In future, therefore, the use of "reheat" for jet-pipe burning may lead to definite misunderstanding; even now, foreign readers of English aeronautical literature may be mystified by the duplication in terminology.

Apart from the danger of misinterpretation, there is the question of a convenient noun for the equipment itself. Does not "afterburner" sound, for some reason, better than "reheater"?

London, W.1. T. G. HICKS,
Man. Dir., Power Jets (Research and Development), Ltd.

The Avro 504

MAY I congratulate Mr. J. M. Bruce on his excellent article on the Avro 504? I have been eagerly awaiting this for many weeks, and I have not been disappointed. May I also thank the Editor of *Flight* for publishing this series of articles? I only hope there will be many more.

Part 2 of "Avro 504" set me browsing through my own files (and adding to them!) and I think that readers may be interested in one or two additional facts. Mr. Bruce mentions the Anzani-engined 504K, G-EBWO. My information differs from his; perhaps some reader can confirm either version. According to my files, -WO was fitted with the 100 h.p. Anzani by the Brooklands Aviation Co. for Dr. M. C. Wall. Eventually the machine passed to the Henderson School of Flying. Later still, it was converted by F. G. Miles to take the 110 h.p. Le Rhône engine. It crashed in April 1929.

One of the "three-pot Avros," a 504K was still flying at Lympne in 1936. Known affectionately as "Screaming Annie," it was registered G-ABVC and owned, I think, by Harold Chater. Other 504K engine variants not mentioned by Mr. Bruce were the 80 h.p. Rolls-Royce Hawk and the 70 h.p. Renault.

Two 504Ms were built, and only one reached the civil register, as K.134, later G-EACX. With the constructor's number ATN.10, it was first registered on May 29th, 1919, and was still flying at Hounslow shortly before the war.

The Avro 548 was originally produced to meet a demand for a stationary-engined type instead of the rotaries of the 504K. Variants not mentioned by Mr. Bruce were the prototype G-EAFH, and G-EAJB. G-EAFH was owned by Giro Aviation Co. and spent most of its life with an A.B.C. Wasp. G-EAJB belonged to the Henderson School of Flying, and had a Bristol Lucifer engine.

I hope all these ramblings may prove of interest to your readers. Somewhere in his article, Mr. Bruce says that to record all the ramifications of this wonderful aeroplane would require a book. How I wish somebody would write that book!

Leeds. DERRICK G. BEETON.

THE following information on the use of the Avro 504 in Denmark may be of interest to some of your readers, or at least to Mr. J. M. Bruce.

D.D.L., which now is a partner in S.A.S., bought three 504Ks in 1919. One was sold to Iceland direct from England and never arrived to this country. Only one of the remainder was given a Danish registration, T-DOLM. It was previously H2549. This aircraft was not used on scheduled services, but only for joy-rides. Together with its unregistered companion it was sold in November 1921 to the Army Flying School.

The Navy bought six 504Ks in December 1920. The Danish designation was L.B. I (Land Biplane I). They were used for training at the flying school, first at Avedore, near Copenhagen, and later at Ringsted. In 1925 a 504N was bought from England. Orlogsværftet (the Naval dockyard) acquired the licence, and three (Nos. 108, 109 and 110) were built in 1926-27. A 504K was also converted to "N" standard. These aircraft were replaced in the middle thirties with Avro Tutors.

One (No. 112) was sold to Nordisk Lufttrafik in 1936 and registered OY-DEL. It was used for towing advertising banners. It disappeared during the occupation; I suppose it was impressed into the Luftwaffe, as were almost all civil aircraft in Denmark. No. 110 survived the war, however, and, after a rebuild at the Air Force workshops at Værlose, it was put on display at the Army museum in Copenhagen in February this year. It is shown together with other old military aircraft, such as a Hawker Dankok and a Donnet-Leveque flying-boat of 1913.

Copenhagen. H. A. KOFOED.

[The Hawker Dankok, mentioned by our correspondent, was a Jaguar-engined development of the Woodcock, built under licence at the Copenhagen Naval Dockyard—Ed.]

Glider Training for Airline Pilots?

IN a recent memorandum seven organizations connected with air transport recommend that recruits for the profession of civil air pilot be sought at the age of 16 to 18 years. They should: (i) be up to the educational standard of the General Certificate with a bias towards science and mathematics; (ii) pass a strict medical examination; (iii) pass a selection board, including representatives of the Board (*sic*) of Education; and (iv) pass a flying-aptitude test. "Acceptance would depend on the instructor's report after up to 8 hours' flying." After acceptance the recruit would obtain a Private Pilot's Licence at a civil flying club, while pursuing a parallel course of technical studies.

The aptitude test is presumably to be done in powered aircraft so that a pupil might be accepted after only a few days' acquaintance with flying. It is noticeable that several Continental countries, who already operate training schools for airline pilots prefer a longer period of assessment and use the gliding clubs for this purpose. The Dutch Government training school, for example, seeks recruits from the schools as young as 15 years and advises them to join a gliding club. After a year or more as a member of such a club a report is compiled on the pupil's progress and it is thought that a much more reliable estimate of aptitude is obtained than by a few hours in a powered aeroplane.

There are several important differences in atmosphere between civil flying clubs and gliding clubs which explain this. At a flying club the pupil tends to have everything, except the flying, done for him. He often arrives, steps into the aeroplane and leaves almost immediately after the flight. Unless he is so minded he plays no part in the organization of the club and is not asked to become one of a team in any way.

At a gliding club, on the contrary, for every minute in the air the pupil may spend half an hour in helping others to fly. The club members seldom have as many professional staff as a flying club so that the moving of the gliders, their inspection, launching and retrieving are all part of the club member's work. A youth taking part in the life of a gliding club soon reveals whether he is a good

and willing member of a flying team as well as a proficient pilot.

The flying of a civil airliner is essentially a team matter so that, in addition to being a good pilot, the captain must be a good team member. The assessment of this quality is much better done by watching a lad for a year or two in a gliding club than by the spot check of a few hours in a powered aeroplane. It is to be hoped that a study of the results of those schools using the gliding clubs will be made before a definite decision is reached.

Bath, Somerset. A. H. Y.

Airliners in Warpaint

I HAVE read with great interest Mr. G. Alan Hill-Reid's letter (July 23rd) concerning the Short G-class boats *Golden Horn*, *Golden Hind* and *Golden Fleece*. As a former flight engineer operating a flying-boat with B.O.A.C. perhaps I may be permitted to fill in one or two gaps in your correspondent's letter.

I believe all three *Goldens* were originally taken by the Air Ministry and used by the Royal Air Force in the early stages of the war, and that *Fleece* was lost off Norway in 1940. Both *Horn* and *Hind* were returned to B.O.A.C. and the latter was lost at Lisbon with all on board during a test flight in 1943. Thus *Hind* became something of a "problem child" from the point of view of routine operations and maintenance, and no doubt caused many a headache during her sojourn in East Africa.

After the war she was disposed of by B.O.A.C. and I believe one or two enthusiastic souls endeavoured to operate her. I was, in fact, asked to serve as flight engineer on a voyage from Poole to the Medway in 1946 or 1947.

Totnes, Devon. D. G. THORPE.

I WAS most interested in the letters dealing with the Handley Page *Hannibal*-class airliners.

I well remember *Helena* at Donibristle, as I had to make a number of visits to that aerodrome during 1941. At that time there was a Royal Naval Communications Squadron at Donibristle and quite a large proportion of its officers were flying with Jersey Airlines up to the war.

Helena was overhauled and test-flown by the Communications Squadron personnel and (again from memory) I believe it made three flights there and on the last flight some damage of a minor nature occurred to one mainplane. After this it remained near the trees on the south side of the aerodrome and was eventually dismantled and used for a time as offices. Other aircraft used by this squadron included two or three D.H. Flamingoes.

I have always considered it a great pity that one of the *Hannibal* class was not retained or at least that the complete fuselage was not retained for possible inclusion in a National Air Museum. I am sure that many will agree with me that this type of aircraft brought flying as near as possible to the most comfortable and luxurious forms of land transport. It was slow, but its advantages outweighed this one disadvantage, and I believe that if they were operated today many would prefer them to our modern projectiles.

Weybridge, Surrey. R. G. J. NASH.

THE letter from Mr. Hill-Reid in your issue of July 23rd has awakened my memories of *Golden Hind*. I must be among the very few people to have flown from Ceylon to East Africa directly across the Indian Ocean as a B.O.A.C. passenger, though R.A.F. Catalinas operated a courier service regularly during a large part of the war. The aircraft was, of course, *Golden Hind*, and the commander Capt. Dudley Travers; the route was the usual one, Kozalla—Addu Atoll—Port Victoria—Mombasa; the dates November 15th-17th, 1944. The passengers were R.A.F. Catalina crews.

In addition, I was aboard *Golden Hind* in 1945 when she had the mishap referred to by Mr. Hill-Reid. She had brought me from Diego Suarez to Kizumu, and was due to proceed thence to Cairo in two days; but, shortly after take-off before first light on April 15th, Capt. Caspareuthus returned to Kisumu with one of the starboard airscrews feathered. After an hour or two's delay we set off again, but on take-off the same engine failed. It did not catch fire, so far as I know: I was told it had seized solid.

Golden Hind was about the most comfortable aircraft I have ever flown in: faster, more roomy and quicker than the Empire boats (she was not stripped of her soundproofing as they were in wartime). There were seats for 44 (all occupied at the time of the engine failure episode), but *no* cocktail bar!

Winchelsea, Sussex. J. D. FAGE.

D.H.6 Memories

I AM well aware that the question of whether the D.H.6 was a good trainer for the *ab initio* pilot must be contentious. I was not aware, however, that my assertion was so amazing.

Obviously Mr. Curtis [Correspondence, July 9th] and I are writing of the same period. At that time, and speaking generally, instruction was of a very doubtful order and, so far as I am aware, without any co-ordination. There were some good instructors, of course, and even today I think with great respect of the famous C.F.S.; but with my first instructor, while I knew little about flying, I realized that he probably knew less. His "technique" of turning was to put on a little bank and take it off again immediately; then, with rudder, he would skid round the corner. This being performed at about 100ft, which height he rarely exceeded, made me glad in retrospect that the aircraft thus mishandled was none other than the D.H.6, because (to quote Mr. Curtis) it indeed "suffered fools gladly." The instructor was not to blame; his was just the method of the period.

Your correspondent who commented on the slow responses of the B.E.2s states that the D.H.6 was almost impossible to spin; yet with the enthusiasm of youth I delighted in spinning—and looping—this plane on most of my early training flights. True, by this time I believe its elevator had been reduced and I must admit that I failed to make it roll, though I tried hard and even in happy ignorance enlisted the aid of a friend to heave on his joystick in the front seat to give the extra purchase I felt it needed.

During the period in which it was used, this hardy trainer was the means of giving large numbers of young fellows the basic elements of flying (such as they could be given then, considering the extreme paucity of knowledgeable instructors and in the very short time permitted) with a very high degree of safety. It was the latter, I feel sure, that D.H. had in mind in designing it.

I cannot follow the reasoning implied in Mr. Curtis' apprehension of what would happen later to pupils who had been trained on this aircraft. I do not think that many would fail to realize that when they graduated to their next and intermediate type they were handling quite a different plane which demanded the skill and judgment to which they adjusted themselves accordingly.

I say this from my own experience both as a pupil who did so and as the instructor I became—with a total of 20 hours' flying experience.

Sanderstead, Surrey. W. ARMSTRONG.

YOUR correspondent Mr. A. H. Curtis (July 9th) mentions one name by which that very angular machine the D.H.6 was known, but I wonder if he remembers the even more descriptive title—"The Sky Hook"?

Richmond, Surrey. A. L. WINTER.

Wanted—a Planetarium

YOUR readers will doubtless be aware, through newspaper correspondence, of the present strong public interest in getting a planetarium established in this country.

It is surely unnecessary to stress, to readers of *Flight*, the great value of a planetarium for teaching navigation and astronomy. It is rather pathetic that this country, so dependent upon navigation in both air and sea, is the only one lacking so essential an adjunct to science and education.

Successive governments have approved the establishment of such an apparatus "when conditions permit" but, as is customary these days, conditions never appear suitable. A recent question in Parliament elicited a reply from the Minister of Education that no progress could be made regarding a planetarium at the Science Museum, London, until approval of the new wing to that building had been obtained. Thus the establishment of a necessary planetarium has been linked with the completion of what must be a million-pound erection. It seems that, until the new wing is built, we shall have to continue to do without a planetarium.

The situation is not without interest on other grounds. At present the aircraft section of the Science Museum is placed outwith the museum proper (where it belongs). It would seem that the new wing could, and should, make provision for housing this fine selection.

Surely it is time that officialdom moved in the matter both to provide the country with at least one planetarium (America has seven) and a proper home for classical aircraft?

London, E.C.4. JAMES LAWRIE.

FORTHCOMING EVENTS

Aug. 2-7. Aero Club de France: World Parachuting Championship, St. Yan, Saône et Rhône.
Aug. 6-8. Royal Danish Aero Club: Invitation rally, Copenhagen.
Aug. 9-11. Institute of the Aeronautical Sciences: Conference on turbine-powered air transport, Seattle, U.S.A.
Aug. 14. Royal Aero Club: National Air Touring Competition, Cranfield.
Aug. 28. Southern Aero Club: Goodyear Trophy Race, Shoreham.
Aug.18-28. "Model Engineer" Exhibition, London.
Aug.29-30. Pescara Aero Club: Annunzio Trophy contest, Pescara, Italy.
Sept. 5. Saar Aero Club: Europe-Pokal display.
Sept. 7-12. S.B.A.C. Farnborough Display and Exhibition.
Sept. 9. Helicopter Association: "Helicopter Contracting," by Knute Flint.
Sept. 9-12. Royal Aero Club: International invitation air rally, White Waltham.
Sept.13-19. Battle of Britain Week.
Sept. 18. R.A.F. "At Home" Day.
Sept.25-26. Aero Club of Germany: Hanseatenflug international rally.
Sept.20-29. Fédération Aéronautique Internationale: 47th annual general conference, Istanbul.
Oct. 15. Rochester Flying Club: Annual dinner and dance, Bearsted.

EXERCISE HAUL

Six NATO Nations Test Their Maritime Defence Forces

THE year's major NATO maritime exercise, code-named "Haul," ended at midday on July 25th. Six NATO nations took part in naval/air operations in the Channel and southern North Sea areas. Nearly a hundred of H.M. ships participated in anti-submarine and mine-sweeping exercises, and there were also E-boat and anti-E-boat operations. The Fleet Air Arm, already to a considerable extent committed in low-level operations connected with the R.A.F.'s Exercise Dividend, played a considerable part both in attacking and protecting the Fleet. Aircraft of R.A.F. Coastal Command were also extensively engaged.

The battle raged from July 16th to 25th, and numerous engagements were fought. From reports issued by the exercise headquarters at Fort Southwick, near Portsmouth, it appears that the liaison and co-operation between air and sea forces of the many different nationalities was close and successful, and the exercise, incidentally, was temporarily interrupted when vessels were diverted to lend assistance to the Danish passenger ship *Princess Ingrid* which caught fire in the North Sea on July 20th.

In addition to the R.A.F. and Naval operations, Exercise Winch was also taking place; this was a beach-brigade manœuvre carried out by the British Army near Zeebrugge in Belgium. Troop- and store-carrying convoys in Winch were protected by vessels engaged in "Haul," and attacked, with some success, by Fleet Air Arm aircraft. As in "Dividend," weather interfered with "Haul" and many of the smaller ships had on occasion to seek shelter. Some personal accounts of the aeronautical aspects of "Haul" appear below.

HELICOPTERS AT WORK

THE Fleet Air Arm and R.A.F. Coastal Command provided considerable forces for Exercise Haul in the Norechan, Benechan and Cherchan areas.* Included among these were, naturally, a number of helicopters to maintain communications and rescue services. The machines were provided by No. 705 Squadron, based at H.M.S. *Siskin* at Gosport and commanded by Lt-Cdr. J. Jacobs; one was working for the exercise headquarters at Fort Southwick, Portsmouth, and another was similarly engaged at West Malling, Kent, for the headquarters at Chatham. A special rescue service had also been laid on at Gosport and Acklington, where Naval S-51s were at instant readiness for rescues in connection with the R.A.F.'s Exercise Dividend. The normal Fighter Command helicopter rescue squadron at Linton-on-Ouse and U.S.A.F. units elsewhere were also on the alert.

The usefulness of the helicopter in ship-to-shore communications in coastal waters was amply demonstrated by one of No. 705's W.S. 51 Mk 3 Dragonflies at Fort Southwick. Flown initially by a R.A.F. pilot and then by Lt-Cdr. H. M. A. Hayes, the machine was running a mail and message service throughout the exercise. It has, in fact, been found that it is quicker to send a message out to a ship by helicopter direct than to encode it, transmit it by radio and then have it decoded at destination. Very often, too, a message "by hand" can be fuller and more explicit than its coded counterpart. Again, small ships may not be equipped for decoding and long delays are caused by the need for retransmission. The helicopter, being a material link in the chain of command, can, of course, also take a specialist officer out on a "recce" of a situation; and, last but not least, it can also provide ships with those small home comforts and personal contacts which help to keep things running smoothly.

Flight's representative was fortunate enough to be taken out from Fort Southwick on one of these liaison sorties by Lt-Cdr. Hayes and his observer/winch operator, Naval Airman Aircrew J. S. Turner. Emerging from the operations room in the bowels of the Portsdown Hills into the bright sunlight on the ramparts, we partly hid some near-respectable suiting under a "Mae West" and climbed aboard. The pilot took off and shaped the Dragonfly's course for the eastern tip of the Isle of Wight.

R/T. contact was established with a group of minesweepers operating in the area and soon they hove in sight, manœuvring placidly in complicated patterns as only Naval vessels can. With the A.S.I. needle flickering in the 70 kt region we soon caught up with them and proceeded to inspect them. Having exchanged stares from close quarters with the occupants of most of the bridges we were invited to make a simulated mail pick-up for my benefit. The canvas message envelope was lowered on a cord to the deck a few feet below and returned with a gift which (as in an amusement-arcade "crane") turned out to be a packet of boiled sweets. After that the demand for message carrying and mail pick-ups kept us shuttling busily for some twenty minutes, like a bee gathering nectar.

When we returned to shore we inspected the beaches east of Portsmouth, obtaining an *Evening Standard* view of many comely bathers, before returning to H.M.S. *Siskin* for refuelling. The pilot backed the machine carefully into its parking space and set it down.

Helicopter navigation—particularly over the sea, with its absence of linear references—is complicated by the peculiar directional behaviour of the machine, but we were told during our visit that it is possible to steer a course to within about three degrees in smooth air. The main difficulty is to do so in rough air and a cross-wind, when drift in degrees may well equal wind speed in knots, due to the comparatively low cruising speed—70 kt or so. Successful navigation in such unfavourable conditions depends largely upon pilot skill. C.M.L.

**NATO command areas; the words represent Nore Channel, Benelux Channel and Cherbourg Channel.*

A SHIPPING STRIKE

ON July 21st the writer was privileged to take part in a typical "Haul" operation flown by Avengers of No. 815 Squadron from H.M.S. *Peregrine* (R.N. Air Station Ford).

Operational briefing at 1420 hr, by No. 815's C.O., Lt.-Cdr. C. W. Rusbridger, showed that the object of the exercise was to locate a small coastal convoy at a point approximately ten miles west of the Hook of Holland at 1630 hr and to make a low-level bombing attack on it. Weather was predicted to be near-perfect throughout the whole operation, with scattered strato-cumulus, cloud-base 2,000ft at take-off, and wind light S.W. Cruising speed was to be 140 kt and altitude 300ft down to 50ft over the sea, climbing to 2,000ft after crossing the English

A "Flight" artist's impression of Grumman Avengers of No. 815 Squadron pulling away after making a low-level bombing attack on a convoy near the Hook of Holland.

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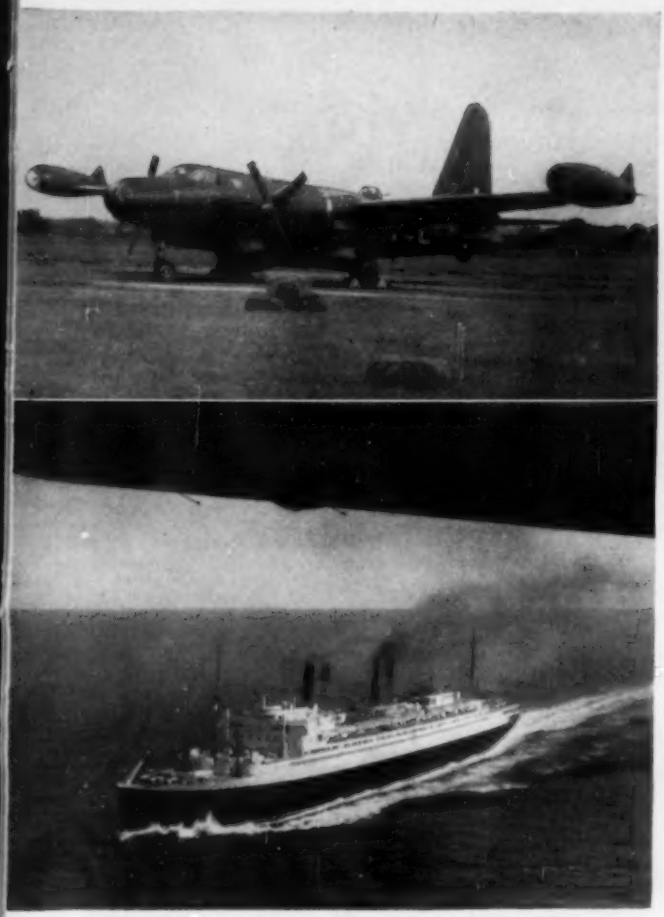


(Upper) A Lockheed Neptune dispersed at Thorney Island. The baled hay is not anti-glider precaution. (Lower) Peaceful interception. The "Ile de France," with crowded decks, proceeds on her lawful occasions.

EXERCISE HAUL . . .

coast on the last homeward leg. The aircraft were to fly in open formation. The first leg was to take the aircraft 30 miles S.W., thence to Cape Gris Nez, and from there up the Continental coast to the expected sighting point near the Hook of Holland. The return was to be made across the North Sea to Deal, and from there direct to Ford.

The attack was to be made by one of No. 815's two tactical flights of four aircraft each, though it should be mentioned here that the well-tried (and well-liked) Avenger A.S.5 three-seat anti-submarine aircraft would not normally be employed for convoy attack. The flight was led by Lt. Burden, with the squadron C.O. as his observer.

At 1445 hr, perched on a dinghy pack in aircraft No. 364 (pilot, Sub-Lt. M. J. Harvey, with observer), and wedged in by an impressive array of electronic gear—in short, trussed up like a chicken—I started to grill under the burning Perspex, but there was soon a refreshing breeze as we started to roll round the perimeter track to the eastern end of the runway in readiness for take-off at 1500 hr.

After a gentle climbing turn to port, we settled down on our first 30-mile track. Under a now cloudless sky the shining royal blue of the other Avengers, with their white squadron insignia, blended with the sparkling green of the Channel swell only a few feet below.

Suddenly we swept over a destroyer almost at mast height and were saluted with a puff of orange smoke as she swung hard aport and then to starboard again onto her original course. After sighting the cliffs at Cape Gris Nez we swept up the French coast. Sundry mercantile and pleasure craft were in evidence, including the rail ferry, hove to off Dunkirk; we "buzzed" a small yacht, but the effect on the crew could not be observed. The beaches of Ostend presented an amazing spectacle, being apparently packed solid with most of the population of Belgium.

After what seemed a very short space of time the "enemy" was located; conditions were ideal for an attack from astern, down-wind and down-sun. The pleasant but rather sedate roar from the Wright Cyclone rose to a more urgent note as our speed mounted to 170 kt on the run in, which was made at about 50ft above the now almost dead calm sea. Facing aft, it was rather difficult to see our own target coming up; but in the last few seconds we saw one aircraft, about 500 yards to starboard, streak in at zero feet and appearing to be in some danger of carrying away the masts of its target ship.

A flashing glimpse of the fore-deck of a frigate escort, puffs of A.A. guns, and we pulled away sharply, at the same time banking vertically to starboard. It was all over in what seemed a matter of seconds, and we were streaking away into the sun, making for Deal.

Soon we crossed the English coast, flying at 2,000ft and with our track lying just south of Ashford and over the Sussex Weald. As we flew over the undulating expanse of the South Downs north of Lewes, the other aircraft of the flight closed up into line abreast. Just north of Brighton, a solitary Tiger Moth serenely crossed our track, flying northwards, and a moment or so later we were overhauled by a formation of Wyverns of No. 813 Sqn. (also from Ford) who had attacked the same convoy as ourselves, and who were going in to land before us.

We passed over Shoreham and the Adur valley, and in a few minutes came the order to break port for a stream landing.

R.M.E.

SUB-HUNTING BY NEPTUNE

AIRCREWS of Coastal Command are accustomed to making long and often uneventful flights over vast expanses of sea. Particularly is this true of submarine patrols, where the monotony of a flight of eight to twelve hours is relieved—if that be the word—only by a series of anti-climaxes such as tracing a radar contact 47 miles and discovering it to be a sizeable bunch of seaweed floating on the surface.

And this was almost the case when I accompanied the crew of Neptune R/L from a crack Neptune squadron (the C.O. of which is S/L. Kerr) on its patrol from Thorney Island during Exercise Haul. It was a daylight trip, with the weather fair and the wind about ten knots, which left the sea quite calm.

On this occasion the crew numbered ten—two pilots, two navigators, one flight engineer and five signallers, the last-named having a variety of radio, radar and gunnery duties.

After briefing, during which time we learned that our patrol area was the "Southern Box"—roughly the southern half of the English Channel, between Dieppe and Cherbourg—we collected flying suits, "Mae Wests," and other necessary paraphernalia.

Take-off time was 1015 hr. Not 15 minutes out we pounced on a surfaced submarine. Bad luck! It was flying a neutral flag. So, in the official vernacular "patrol was resumed."

For short-range radar observation of anything up to approximately 50 miles, the aircraft remains at a fairly low altitude and flies slowly, going lower still only to investigate a contact which defies observation from the loftier position. After the submarine incident radar contacts were numerous. Whatever the range and bearing, each one was meticulously investigated. Mostly they were fishing smacks or coastal vessels but on several occasions they were bouys adrift and even a few seagulls on the water.

"Tiny contact at bearing 225, range twelve miles, sir!" "Roger" comes back the reply from the captain over the intercom. The aircraft banks round on to bearing 225.

"Contact dead ahead, sir. Range eleven miles . . . Range ten miles, sir . . . Nine miles . . . Eight . . . Contact disappeared, sir!"

The navigator is working furiously, plotting where the contact disappeared. Two signallers open the after-hatch and prepare a smoke marker and sono-buoy for dropping.

"Ten, nine, eight . . . two, one, now!" Away marker and buoy! The aircraft banks steeply to get into position for dropping a pattern of more buoys. Meanwhile the sono-set operator is listening in to the first sono-buoy. On this occasion no echoes were transmitted by the buoy. The disappointment was keen. There was much speculation as to what the object was, but no conclusion was reached.

And so the patrol went on. About half way through, a welcome meal and tea was prepared on the galley hotplates. Good stuff this! Buttered toast, too! Nothing like a good meal to renew interest . . .

More contacts, more fishing smacks. Here is a very large liner. "What is she?" The name painted on her bows turns out to be *Ile de France*.

At 1915 hours, and just a little tired, we turn for home. No subs on this trip; but four kills so far this week by one squadron is excellent by any standards.

Half an hour later we are back at Thorney, taxying along the perimeter track and oh, isn't it bumpy on the ground!

C.M.

CIVIL AVIATION

PLAN FOR TOMORROW: Differences between the Comet 3 and its predecessors are pronounced in this view from beneath. The new Comet, now at the beginning of its flight trials, is not due to enter service before 1956. Orders have been placed by B.O.A.C., P.A.W.A. and Air-India.

THE GATWICK REPORT

SOON after the Government's decision, announced in July 1952, to develop Gatwick as a bad-weather alternative to London Airport, it became evident that local resistance to the project was unusually strong and well co-ordinated. Since there are no large stretches of barren ground naturally suitable for the siting of an airport within reasonable distance of London, it was inevitable that any site selected would have been described as unsuitable by the affected citizens. In the case of Gatwick, however, opposition was so powerful that the Minister of Housing and Local Government was forced, last January, to appoint a public inquiry into the objections to the Gatwick scheme.

Sir Colin Campbell, who was chosen to make the inquiry, has now issued his report, which was published as a White Paper on July 20th. He concludes that "On balance I consider the Ministry's contention that Gatwick is a 'suitable' site for an aerodrome for the purposes for which they intend to use it was established. As to whether it is the most suitable site which could be found, it is not, because of the limitations of the scope of the inquiry, possible for me to express an opinion."

Sir Colin's terms of reference were as follows: "The purpose of the Inquiry is to hear and report on local objections to the proposed development of Gatwick as a major airport. Local objections mean objections relating to the suitability of the site chosen for the purpose or to the effect of the proposed development on local interests. In addition, it will be open to objectors to suggest detailed modification of the scheme on the site as now proposed. It will not, however, be open to them to question the need to provide a major airport to serve as an alternative to London Airport nor to make proposals as to how that need should be met."

The report summarizes evidence given for and against the Gatwick plan during the course of the inquiry, which was held at Horley, Surrey, from March 16th to April 8th. It will be recalled that there are three uses to which the Ministry of Transport and Civil Aviation proposes to put a developed Gatwick Airport: (a) to be the main alternative airport for diversions from London Airport; (b) to take over from London Airport and Northolt certain services, particularly to the Channel Islands and near continental points, which operate at seasonal peaks; (c) to serve as a base for charter flying.

The case for the Ministry was opened at the inquiry by Mr. Michael Rowe, who summarized the Gatwick plan as follows: "Stage I of the proposals covers the use of 600 acres of land on which will be constructed the southern runway of 7,000ft, a Maintenance Area and Terminal Area. A considerable diversion of the main London-Brighton road (A.23) and of a few minor roads will be necessary, a land drainage scheme involving the diversion of waterways must be carried out, and between 60 and 70 dwellings destroyed. All this and other work and acquisitions will, it is estimated, cost £6m. Stage II provides for the acquisition and incorporation of 400-500 more acres of land, the construction of a northern runway of 6,000ft and a subsidiary runway of 4,000ft, running north-east/south-west between the two main runways, at a total estimated cost of £4m. The total area of the aerodrome would then be about 1,100 acres."

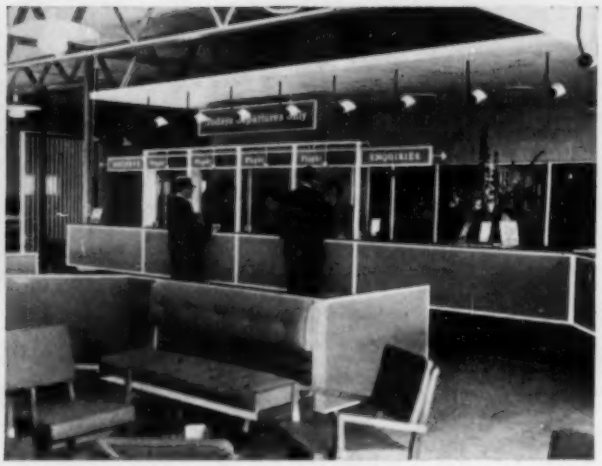
Mr. Rowe emphasized that the first essential for a new airport was that it should fit in to the air traffic control system operating in the part of the country where it is to be situated. He admitted that in 1949 the Government had twice stated that it was not intended to develop Gatwick, but said that when these assurances were given it was believed "that a period of peace was likely to be ahead" but that "since that time the re-armament programme has commenced and Stansted aerodrome, which it was hoped would be used as an alternative for London Airport, is now practically unusable for civil aircraft. Secondly, the growth of air traffic to the south-east of London has been very much greater than was anticipated . . ."

The Ministry's Director of Control and Navigation, Capt. V. A. M. Hunt, confirmed that the Gatwick site was suitable from an air-traffic control point of view, and Mr. G. W. Stallibrass, Director of Aerodromes (Technical), testified that in relation to international standards, Gatwick would be better than any U.K. airport, other than London Airport. At Gatwick the only departure from I.C.A.O. practices would be to permit objects projecting not more than 25ft above the normal approach gradient at Russ Hill to remain. Statistics put forward by Mr. A. C. Best, of the Air Ministry Meteorological Office, showed that it was possible to use Gatwick on about 50 per cent of occasions when L.A.P. was closed by weather. Mr. Best said that despite radiation fog, which was more likely at Gatwick than at London Airport, and apart from the possibility of pollution from Crawley [due to future industrial development at the new town], he would be perfectly happy to see the airport put at Gatwick; he did not think, however, that a decision should be made on meteorological grounds.

Two Corporation pilots spoke in favour of the project. Capt. P. E. Bressey, B.E.A., did not regard the presence of Russ Hill as a danger to aircraft coming in from the west if all proposed aids were available and working, but said that large, long-distance aircraft might be restricted as to weight when taking off to the west. A B.O.A.C. Stratocruiser pilot, Capt. John Woodman, chairman of B.A.L.P.A., expressed the opinion that he would be prepared to land on the southern runway, if all facilities were installed, with a 300ft cloud base. Without I.L.S., which he estimated to be inoperative about 10 per cent of the time, he would regard 500-600ft cloud base and forward vision of one to two miles as appropriate minima. The Board of B.A.L.P.A. had no technical objection to the proposed development of Gatwick.

Evidence was given by Mr. J. W. L. Ivimy (head of the division of the M.T.C.A. responsible for the general

D.E.T.A. DOVE: Six Dove feederliners, one of which is seen in this picture, are among the fleet operated from Portuguese East Africa by Divisao de Exploracao des Transportes Aéros.



FERRYFIELD IN ACTION: Silver City's private airport at Lydd, Dungeness, has been in operation since July 13th. These new pictures show the attractive layout of the passenger concourse, as viewed from the outgoing or "air" side: (left) bank, R.A.C. and A.A. offices; (right) the reception and ticket counter. As recounted overleaf, Ferryfield contributed to the new cross-Channel traffic record set up by Silver City Airways on July 27th.

policy and planning of London, Northolt and Gatwick Airports), that assuming an index of 100 for air transport movements in the London area for 1949, the index for 1960 would be 183. There was congestion now in the air pattern at London and Northolt, and Northolt was soon to be abandoned. He said that an expenditure of £6m on an airport used merely for diversionary purposes would be unjustified but that its additional use as a base for overflow traffic and charter operation fully justified the total expenditure of £10m.

For British Railways, Mr. C. Wynne-Davies said that it was intended to close Gatwick Airport Station and to enlarge Gatwick Racecourse Station, from which there would be a twice-hourly fast service (38 min) to London. There would also be two semi-fast (50 min) trains hourly. The cost of developing the Brighton Line, to make possible this service, would be about £1m, towards which the M.T.C.A. would make a substantial contribution. It was expected that 340,000 air passengers would use Gatwick in the first full year of operation and that 75 per cent of this number would travel by rail.

In a statement to the inquiry, the chairman of B.E.A., Lord Douglas, said that in view of these efficient rail services it would be possible to do away with the Corporation's responsibility for handling passengers in London, but it remained B.E.A.'s object to maintain their base at London Airport and to operate as many of their services as possible from there.

Witnesses for the Crawley Development Corporation gave evidence that despite their original objections to the Gatwick plan the Corporation had concluded that "the national need of civil aviation must over-ride planning considerations."

For the West Sussex County Council it was admitted "that it would, of course, be difficult to find a site where there would not be the objections which we have already heard in this inquiry." The Council neither opposed nor supported the proposal.

A former Deputy Director of the Meteorological Office, Mr. Ernest Gold, appearing for the Surrey County Council, put forward the view that Gatwick "was not merely not ideal, but was thoroughly bad as a site for an airport, whether as an alternative or in its own right."

Summing up for the Council, Mr. Geoffrey Lawrence referred to the Ministry's submission that the alternative airport would have to be sited between Airways Amber 1 and Amber 2; he said: "If that is the inescapable hypothesis, I cannot imagine that there can be any other candidate for the honour except Gatwick." But he challenged that basis and suggested that traffic routes must be designed to fit in to the convenience of airports, and that it was not beyond the capacity of the M.T.C.A. to arrange traffic routes so that other sites could be considered. Several other objections were made on the grounds of noise, danger or loss of property or money invested in property.

Sir Colin Campbell, in his summing up, asked that all possible and reasonable steps be taken to minimise hardship caused by the plan if the Government decided to proceed with it. In particular he urged strongly "that whatever can be done in the construction of the airport and in its subsequent use to minimize the effects of noise both from the maintenance area and from aircraft shall be provided."

AER LINGUS LOSE

DURING the financial year ended March 31st, 1953, Aer Lingus incurred a net loss of £62,663. As in the financial year 1952-53, when the loss was £85,718, it is not intended to call upon the two shareholders—Aer Rianta and B.E.A.—to make good the deficit by subsidy; an application will be made, however, for a loan. The new Viscounts, of which Aer Lingus now have four, were not in operation during the year under review. No specific reason is given for the deficit; the company notes, however, that there was a six per cent increase in revenue against a four per cent rise in costs. Now that the Viscounts are in service, this favourable trend may be accelerated. During 1952-53 Aer Lingus carried 297,000 passengers, and the average load factor was 70 per cent.

I.A.T.A. AND AIRWORTHINESS

THE historical background to the complex problem of airworthiness standards was set out with commendable simplicity in a recent statement by the International Air Transport Association. The matter is one of topical importance, since the Air Navigation Commission of I.C.A.O. has reported that the formulation of a set of complete, comprehensive and detailed international airworthiness requirements is not practicable of attainment.

I.A.T.A., speaking for the majority of scheduled operators, expresses the following views:—

"Before any aircraft can be used in transport operations, it must meet the airworthiness requirements set up by the government of the State in which it is manufactured and be accepted by the authorities of the other States in which it is to be used. These requirements cover, for example, aircraft structures, engines, propellers, design and construction. In addition, and of particular interest to the operator, airworthiness requirements stipulate the performance required of an aircraft in order that it may be considered acceptably safe for commercial operation.

"Performance codes have, for the most part, been developed separately by individual States. The results of the first post-war attempt to set up an international standard code through I.C.A.O. were, in 1949, set forth in two Annexes to the I.C.A.O. (Chicago) Convention—Annex 8, which deals with airworthiness generally, and Annex 6, which deals with the operational phases of international commercial air trans-

READILY TO HAND: Ferryfield's control tower is equally well laid out; shown here is the new control desk designed and installed by Racal, Ltd., to the airline's requirements.

CIVIL AVIATION . . .

port. For lack of anything better, the performance parts of these Annexes were based almost entirely on the U.S. performance regulations, which were generally built around the DC-3 and which dated back to about 1940. Subsequent progress in aircraft design and in the development of new power-plants has made these I.C.A.O. standards obsolescent: the U.S. itself has since had to revise its own code and governments generally have felt that the I.C.A.O. Annexes are not only incomplete, but also do not provide a proper basis for the elaboration of new and more detailed international specifications. As a practical situation, therefore, there is no effective international agreement on performance requirements.

"I.C.A.O. has actively been seeking to remedy this situation and since 1951 its Standing Committee on Performance (S.C.P.) has been working on the development of an entirely new type of code. Where the old requirements were necessarily based on arbitrary assumptions in the absence of any large background of systematically recorded operational experience, the S.C.P. has been seeking a 'rational' basis for the new code—that is, one which will be derived from the statistical experience of actual aircraft operation and which will take into account the variation and probability of occurrence of all factors having a deleterious effect on aircraft performance. Such a work, however, can progress only slowly: in the meanwhile, new aircraft are being designed, new forms of power exploited, new kinds of operations begun, and individual governments must rely on their own national codes to deal with them. . . .

"In their statement, therefore, the international carriers, through I.A.T.A., reiterate their consistent support of the efforts of governments to devise a new, practical and internationally accepted code of performance requirements. They also reaffirm their stand that such a code should be based on a 'rational' approach and statistically derived from the examination of all stages of flight. They also repeat their unanimous recommendation that performance requirements for conventional piston-engined aircraft should not be automatically applied to all turbine-engined equipment, and that requirements should therefore be separately but simultaneously developed for the two categories. I.A.T.A. further stresses the airlines' belief that for practical reasons, international standardization must be sought by national enactment of a uniform code worked out in I.C.A.O."

DC-7 WITH TURBOPROPS

FOLLOWING close on the announcement (see page 174) of the Douglas Aircraft Company's projected DC-7C with improved turbo-compound engines comes an *American Aviation* report that a turboprop version, designated DC-7D, may be evolved for delivery in four years' time. The project is described as follows: "Like other manufacturers of commercial transports, Douglas has long been interested in developing a turboprop plane, but has been blocked by the lag in engine progress. The Rolls-Royce RB109 looks like it might fit the DC-7 configuration quite well. It develops approximately 4,400 s.h.p., which is just about right, and it is a modified two-spool design with attractive specifics. Douglas estimates that with this power the DC-7D would have a block speed of approximately 380 m.p.h. and a range of 4,300 nautical miles with 15,000 lb. payload."

As first reported in *Flight* last April, Rolls-Royce are known to be well ahead with the development of a new private-venture civil turboprop. The initial output was given as about 2,500 s.h.p., although potential output was thought to be much greater. According to *American Aviation* the new turboprop has not yet started running but is due to begin bench testing this autumn. Its designed output is said to be "the highest power that Rolls-Royce engineers considered feasible for a propeller turbine engine."

On July 28th, incidentally, a ceremony was held at the Douglas plant at Santa Monica to mark the completion of the 500th aircraft of the post-war DC-6/7 series—a DC-6B for Western Air Lines. The manufacturers estimate that since the first DC-6 was delivered in 1946 a total of more than 3,700,000 flying hours has been logged by the 38 airlines using DC-6s, '6Bs and '7s.

CROSS-CHANNEL AIR SHUTTLE

BETWEEN the normal operating hours of 8 a.m. and 7 p.m. on July 27th, vehicle-ferry aircraft of Silver City Airways made 222 crossings of the English Channel—a company record. The previous record for a single day's work on the cross-Channel ferry was 180 trips. Of the new record total, 98 crossings were between the new airport at Ferryfield and Le Touquet. The other flights were made on the Lympne-Calais, Lympne-Ostend, Southampton-Cherbourg and Gatwick-Le Touquet routes. On average, therefore, Silver City's Bristol Freighters and Superfreighters were taking off or landing at a rate of once every 1½ min throughout the working day.

B.E.A. TRAFFIC TRENDS

PROGRESS made by B.E.A. during the second quarter of this year is shown by statistics in the current issue of the Corporation's house magazine. In relation to the results for the corresponding quarter of 1953, the number of passengers carried went up by 12 per cent to 485,000, and the total ton-miles sold increased by 19 per cent to nearly 16m. Freight ton-miles flown (1.39m.) showed practically no change, but there was a 13 per cent increase in mail traffic (655,000 ton-miles). The increased average capacity of the B.E.A. fleet, resulting largely from the introduction of Viscounts, is reflected by the fact that revenue hours flown during this period totalled 38,991—10.4 per cent fewer than in the second quarter of 1953.

In the same issue of the magazine, Mr. Peter Masefield, chief executive, attacks a "growing tendency for spurious, semi-political and altogether doctrinaire, anti-Corporation carping on the part of some of the more rabid and hide-bound supporters of the so-called 'independents'." After referring to B.E.A.'s excellent relations with the major shipping companies, Mr. Masefield adds: "But we do not try to run services for them . . . They should stick to their own job."

BREVITIES

RESPONSIBLE for operation and maintenance of the four Hermes IVs which recently resumed service on B.O.A.C.'s East African routes are Capt. W. B. Houston and Mr. R. A. V. Dismore. Capt. Houston is manager of the Corporation's Britannia fleet and Mr. Dismore is fleet maintenance engineer, Comets.

* * *

Other recent B.O.A.C. appointments include that of Mr. W. B. Sherwood as station manager, Keflavik, who succeeds Mr. F. Bastard on August 25th. Mr. Sherwood's post as B.O.A.C. representative, Bangkok, will be filled by Mr. D. A. Newman.

* * *

Washington reports suggest that the Japan Air Line's application for traffic rights at Los Angeles is unlikely to be approved by the C.A.B. The company has traffic rights at Seattle as well as at San Francisco, terminal for its present trans-Pacific services, but its offer to exchange Seattle for Los Angeles, which generates more traffic, has met with a cool reception.

* * *

Originally placed in service on the Amsterdam-London route in 1948, K.L.M.'s first Convair 240, PH-CEB *Rembrandt*, completed 10,000 flying hours on Saturday, July 24th.

* * *

Correct registrations for the three Viscount 732s ordered by Hunting-Clan Air Transport are G-ANRR-T inclusive and not as quoted in *Flight* of July 2nd.

* * *

American interests in the Viscount, already keen, was sharpened by the announcement of Capital Airlines order for three of these aircraft, with an option for a further 37. Recent visitors to the Vickers-Armstrong's factory at Weybridge have included two senior executives of Northwest Airlines—Mr. F. C. Judd, vice president, operations, and Mr. F. Emerson, European director.

* * *

Pilots of American Airlines went on strike last Saturday in protest against the non-stop DC-7 flights from New York to Los Angeles. The schedule of 8 hr 35 min contravenes normal C.A.B. regulations for domestic operations, and a special regulation waiving the so-called "eight-hour" rule was adopted on June 14th. At the time of going to press all American Airlines services were suspended.

* * *

Canadian Pacific Airlines are reported to be considering the acquisition of a number of C-46 Commandos for service as freighters on their northern routes. Rejection by the Canadian Government of a proposed express freight service across Canada has caused C.P.A. to sell their two new DC-6A Liftmasters: one was bought by Northwest Orient Airlines and the other has gone to Aigle Azur.

* * *

Aero Ypenburg will be the first Dutch company to take delivery of a Hiller helicopter—a model 12-8. A similar helicopter is being obtained by the Puerto Rico Water Resources Authority to replace the Hiller 360 which it has operated since 1950. Two more Hiller 12-B three-seaters are going to Philippine Air Lines, increasing the company's fleet to four. First of the major airlines to acquire Hillers, P.A.L. use the helicopters for passenger and cargo services and for a variety of specialist applications, including pay-roll deliveries in mountainous areas, aerial photography, pilot training, emergency work, and survey.

AT TANGMERE: The Queen leaves the R.C.A.F. Canadair C-5 after bidding the Duke of Edinburgh farewell before he left for Canada. (Right) Flying the Duke's personal standard, the C-5 taxies from the apron to the take-off point.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

The Duke's Canadian Flying

FOR his tour of Canada, the Duke of Edinburgh left Tangmere, England, for Ottawa on the evening of July 28th in a Canadair North Star C-5 of the Royal Canadian Air Force.

The Queen, with the Duke and Duchess of Norfolk, with whom she was staying, were at the airfield to see the aircraft take off at 1922 hr. The C-5 arrived at Keflavik at 0051 hr, July 29th and stayed for 90 minutes to refuel before leaving for Goose Bay. He arrived at Ottawa at 0930hr.

Various aircraft are being used to enable the Duke to fulfil a very busy programme. From Ottawa he was due to go to Chalk River by Otter, reverting to the C-5 to travel to Rivers and Victoria.

His journey from Kitimat to Sandspit is due to be made by a Canso and this amphibian will also be used for touring the northern areas. The journey south to Quebec *via* Churchill will again be by C-5, which will also be used for travelling the final stage from Knob Lake to Goose Bay but the journey from Mile 80 to Knob Lake will be by Dakota.

W/C. H. A. Morrison, R.C.A.F., has been appointed Captain of the Duke's Flight.

Cranwell Passing-out Parade

THE flag of SHAPE flew alongside that of the R.A.F. over the R.A.F. College, Cranwell, on July 27th, when General A. M. Gruenther, Supreme Commander, Allied Forces, Europe, reviewed the passing-out parade of No. 62 Entry. The Entry consisted of 45 flight cadets, of whom seven were destined for the Equipment Branch and two for the Secretarial Branch.

After presenting the Sword of Honour and the Queen's Medal to F/Cdt. Sen. U/Off. P. H. Stanning, General Gruenther recalled in a speech that he himself had taken part in a very similar parade at West Point in 1918. On that occasion it was announced that the course due to graduate in 1921 would instead pass out on November 1st, 1918; and the Germans surrendered just 11 days after that date. He did not expect that the present Entry would have a similar effect on a future conflict, but he did stress the fact that the cadets would find themselves more than ever engaged in operations alongside officers of other NATO nations. He went on to say that no nation could now stand by itself, and that the R.A.F., which he considered second to none, would play a major part in the defence of peace.

After the parade, General Gruenther inspected the College Flying Wing on the north airfield (the south airfield is at present out of commission while a runway is constructed to accommodate Vampire Trainers), and planted a tree in the College grounds.

Among the distinguished guests present at the ceremony were Air Marshal Sir Ronald Ivelaw-Chapman, D.C.A.S., Air Marshal Sir Dermot Boyle, A.O.C-in-C., Fighter Command, and a number of officers from the R.C.A.F., the U.S. Army, and the U.S.A.F. After lunching in the College, General Gruenther departed in his personal Constellation.

Prizewinners: F/Cdt. Sen. U/Off. P. H. Stanning, Sword of Honour, Queen's Medal, A. G. Fellowes Memorial Prize, United Services Institution Award; F/Cdt. Sen. U/Off. E. D. Frith, Philip Sassoon Memorial Prize; Sen. F/Cdt. I. D. Brimson, R. M. Groves Memorial Prize, Hicks Memorial Trophy; Sen. F/Cdt. C. P. James, Air Ministry Prize for Equipment Studies; Sen. F/Cdt. D. M. Richard, Dickson Trophy and Michael Hill Memorial Prize; F/Cdt. Sen. U/Off. I. H. Keppie, J. A. Chance Memorial Prize; Sen. F/Cdt. A. Dufton, Air Ministry Prize for Secretarial Studies; Sen. F/Cdt. A. J. W. Whitaker, Air Ministry Prize for Imperial and War Studies.

BRITAIN'S WEST POINT: General Alfred M. Gruenther, Supreme Allied Commander in Europe, takes the salute during the passing-out parade of the 62nd Entry at R.A.F. College, Cranwell.

World Parachuting Championships

UNDER the charge of W/C. J. R. W. Blyth, A.F.C., who has himself made over 1,000 jumps, four instructors from No. 1 Parachute Training School are forming part of the British team in the World Parachuting Championships held from August 2nd to 8th at St. Yan airfield, France. They are: F/L. W. T. H. Hay, F/Sgts. H. Wood and A. Card and Sgt. T. Maloney. In reserve are F/Sgt. D. Sutton and Sgt. N. Hoffman. The civilian member of the team is A. J. Harrison.

Sir Raymond Quilter is piloting his own D.H. Rapide, from which the drops are being made and Major T. W. Willans is the despatcher. Capt. Huggins is operating the Decca Flight Log used for dropping. Mr. John Beadle, chief project engineer of the G. Q. Parachute Co., Ltd., is doubling as "met" man and statistician and Mr. Frank Dodd is seeing to 'chute repairs and packing.

Exercise Medflex B

SHIPS of six navies, French, Greek, Italian, Turkish, British and United States, took part in Exercise Medflex B, which was held in the Ionian Sea and Malta areas from July 20th to 23rd. Overall control was in the hands of Admiral the Earl Mountbatten of Burma, C-in-C. Allied Forces, Mediterranean. The opposing sides were called Orange and Blue, the former commanded by Admiral Girosi (Italy) and Admiral Lappas (Greece), and the latter by Admiral Altincan (Turkey). Blue headquarters were at Malta, and Orange (enemy headquarters) in Athens. Only in Admiral Mountbatten's headquarters were the two commanders' plans simultaneously known.

The opening rounds of the exercise were mainly concerned with manœuvring

AT HALTON during the passing-out parade of the 69th Entry: (Left) A handshake of congratulation from Air Chief Marshal Sir Arthur P. M. Sanders, the reviewing officer, for Cpl. App. E. H. James, winner of the Quinton Trophy for the best ex-A.T.C. cadet. (Centre) Air App. Syed Ali Raza, best Pakistan apprentice, who won the Azhar Shield. (Right) F/Sgt. App. T. G. Gordon, best all-round apprentice, with an armful of prizes.

SERVICE AVIATION . . .

for position and E-boat and submarine attacks against a series of convoys. U.S. Navy Neptunes based at Malta carried out anti-submarine, reconnaissance and mine-laying operations, while air attacks on the island were warded off by Vampires of the Australian Fighter Wing, also based on the Island. Dog-fights took place over the Messina Straits between Italian Air Force Mustangs and Lightings and Australian Vampires.

The climax of the exercise involved an amphibious landing on Malta by an Orange task force. The force was first spotted and shadowed by Neptunes, and then attacked by destroyers and E-boats, and defended by cruisers and destroyers. A sharp engagement took place on the night of the 22nd, and at 0445 hr on the 23rd the Orange forces stormed ashore. Italian Air Force fighters provided air cover, while Australian Vampires strafed the invading force, which was made up of 800 men of No. 42 Royal Marine Commando and French commandos. Shackletons operated throughout the exercise from Greek bases on the Orange side.

In the 16 months since the Combined Mediterranean Command was formed, excellent progress has been made in international co-operation, and Lord Ismay, who visited the Malta headquarters with the North Atlantic Council during most of the exercise, expressed great satisfaction at the results achieved. After the exercise, ships and crews of all six navies foregathered at Valetta to discuss and assess the exercise. Each ship had carried a neutral umpire throughout the exercise, to adjudicate on the results of each engagement.

R.N.Z.A.F. Queen's Colour Paraded

THE Colour presented to the Royal New Zealand Air Force by the Queen during her Commonwealth tour was paraded last month for the first time at the opening of the New Zealand Parliament. P/O. R. M. Hancock, R.N.Z.A.F., a recent graduate of the R.A.F. College, Cranwell, was the colour-bearer. A guard of honour was provided and there was a fly-past by Vampires of No. 75 Squadron, R.N.Z.A.F., based at Ohakea.

R.A.F. Appointment

IT is announced by the Air Ministry that A. Cdre. G. P. Chamberlain, C.B., O.B.E., is to become A.O.A. at Fighter Command. He will assume the acting rank of air vice-marshal.

Since April 1953 A.V-M. Chamberlain has been Commandant of the R.A.F. Staff College, Andover; previously he commanded the Transport Wing of the Middle East Air Force. In the early months of the war he was signals staff officer at H.Q. No. 18 Group and later commanded the Fighter Interception Unit until going to Coastal Command, also as a signals staff officer.

In his next appointment he was seconded to the Royal Australian Air Force on signals duties for a year and on his returning to England towards the end of 1944 was appointed Chief Signals Officer of Transport Command on the Empire and trunk routes and in the European theatres of war. In 1947 he was seconded from the R.A.F. to fill a new appointment at the Ministry of Civil Aviation as Director of Civil Air Operations, a post he held for nearly two years until he went to the Imperial Defence College.

A.V-M. Chamberlain was commissioned from R.A.F. College, Cranwell, in 1925.

Tonga Air Lift

AN airlift of nearly 80,000 lb of army equipment from New Zealand to Tonga was recently completed in just over a week in the Bristol Freighters of No. 41 Transport Squadron, R.N.Z.A.F. The materials transported constituted basic training equipment for a local defence force now being organized by the Tongan government.

The Alamein Memorial

THE Alamein Memorial, which is being built by the Imperial War Graves Commission in the battlefield cemetery in the Western Desert, is now nearing completion. It will be unveiled by Field Marshal Lord Montgomery on October 24th, the twelfth anniversary of the battle of El Alamein, in the presence of representatives of the armies and air forces in which the men whose names the memorial bears were serving. The Commission finds it impossible to extend invitations to all the relatives to be present, but photographs of the ceremony and of individual name panels will be available.

The memorial has been constructed to the design of Sir Hubert Worthington, O.B.E., A.R.A., and consists of a cloister on the northern side of the battlefield cemetery at El Alamein in the Western Desert. Within this cloister are inscribed the names of 11,945 officers and men of the land and air forces of the Commonwealth who have no known grave. Of these names 3,200 are of men of the air forces who were killed during operations from bases in the Eastern Mediterranean, the Near East and East Africa.

A short avenue from the main desert road leads to a forecourt, where three arches open into the cloister; at each side a broad flight of outside steps leads to the roof which commands a fine view of the surrounding country and the sea. Over the entrance appear these words:—

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The cloister opens to the south upon a series of terraces and flower-beds leading down to the cemetery and to the Stone of Remembrance and, beyond it, the Cross of Sacrifice found in Commonwealth war cemeteries all over the world.

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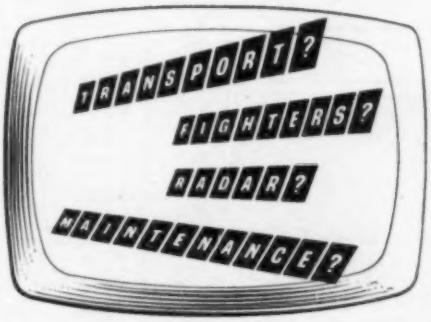

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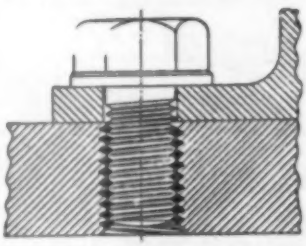

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PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:—

APPLICATION No. 43/2. From Airwork, Ltd., of 15 Chesterfield Street, London W.1. For an amendment to the Colonial Coach Service which they are at present approved by the Minister of Transport and Civil Aviation to operate between London and N'dola, Lusaka and Salisbury (S. Rhodesia) via Malta, so as to permit an increase in frequency up to three return services in each four-week period during the season from 1st October to 31st March inclusive, and up to four return services in each four-week period during the season from 1st April to 30th September inclusive, during the period up to 30th September, 1955.

APPLICATION No. 18/2. From Hunting-Clan Air Transport, Ltd., of 5 Fitzhardinge Street, Portman Square, London W.1. For an amendment to the Colonial Coach Service which they at present are approved by the Minister of Transport and Civil Aviation to operate between London and N'dola, Lusaka and Salisbury (S. Rhodesia) via Malta, so as to permit an increase in frequency up to three return services in each four-week period during the season from 1st October to 31st March inclusive, and up to four return services in each four-week period during the season from 1st April to 30th September inclusive, during the period up to 30th September, 1955.

APPLICATION No. 318. From Airwork, Ltd., of 15 Chesterfield Street, London W.1. For normal scheduled and all-freight services for the carriage of passengers and freight with Viking and Dakota and later with Bristol 170 aircraft, at a high daily frequency for a period of seven years from 1st April, 1955 between Southend, Manston, Lympne, Gatwick, Southampton and/or Hurn on the one hand and Amsterdam, The Hague, Antwerp, Knocke-le-Zoute, Ostend, Calais, Le Touquet, Deauville, Cherbourg, Dinard and/or Lille on the other hand.

THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on 30th July, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3 Dean's Yard, Westminster, London S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [2410

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SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service, etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order 1952.

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APPLICANTS must be experienced in Aircraft Stress technique, and up to degree standard.
HOUSING accommodation will be provided for successful applicants after normal probationary period.

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VACANCIES exist for personnel to join an expanding Design and Development team for work on new projects including aircraft hydraulic mechanisms.
EXPERIENCE of aircraft component designs, testing and good technical qualifications essential.
APPLICANTS please state age, qualifications, experience and salary required. [2385

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Experience of light hydraulic and pneumatic equipment would be advantageous.

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Electronics Engineers

with an interest in mathematics, are required by 'ENGLISH ELECTRIC' to work on fault diagnosis and maintenance of advanced digital computors, in the London Area.

Please reply to **Dept. C.P.S., 336/7 Strand, W.C.2, quoting Ref. 1353.**

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A VACANCY exists for an independent forecaster, Meteorological Department, Bermuda.
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APPLY in writing to the Director of Recruitment, Colonial Office, Great Smith Street, London, S.W.1, giving briefly age, qualifications and experience. Mention the reference number BCD.57/29/01. [2395

ROTAL LIMITED, GLOUCESTER

SENIOR drawing office instructor. An interesting position is offered to an experienced mechanical engineering draughtsman to undertake the training of draughtsmen apprentices and trainees in the company's training school. Applicants should hold a Higher National Certificate in mechanical or production engineering and teaching experience would be an advantage. Salary in the range of £600-£750 in accordance with qualifications and experience. Superannuation and welfare schemes are in operation. Reply, giving particulars of education, training and experience to the Personnel Manager, Rotol Limited, Cheltenham Road, Gloucester. [2399

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AIRWORK, Ltd., require aircraft electrician, preferably with experience on Mosquito, Hornet and Meteor aircraft. Apply: Chief Engineer, Airwork, Ltd., R.N.A.S., St. Davids, Pembrokeshire. [2396
SIR W. G. ARMSTRONG WHITWORTH AIRCRAFT, Ltd., have vacancies for the following qualified engineers for flight trials work on guided missiles.
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NORMALAIR, Ltd., have vacancies in Yeovil for design draughtsmen, D.O. checkers, technicians, stressmen, liaison engineers, for work on aircraft pressurizing and high-altitude breathing equipment and cold air units.
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LOCAL interviews arranged where convenient. [2343
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The English Electric Co. Ltd.,

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MECHANICAL ENGINEERING DEPARTMENT AT LUTON

SENIOR DESIGN ENGINEERS
Age 28-35

Minimum qualifications H.N.C. standard with sound engineering training and experience. Applicants must be capable of initiating original designs, and some supervisory experience would be an advantage but not essential.

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O.N.C. standard to work in conjunction with Senior Engineers developing designs to a fully completed stage. A sound knowledge of workshop practice is desirable.

All positions require a thorough drawing office background in Light/Medium Mechanical or Electro Mechanical Engineering. Successful applicants would be engaged on the original design of a wide variety of laboratory equipment, test rigs and specialised machines. Good salaries and conditions for the right men. Apply to Dept. C.P.S. 336/7 Strand, W.C.2, quoting Ref. 1261A.

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for Military and Civil aircraft, preferably with an "X" licence for the latter.

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SITUATIONS VACANT

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CANDIDATES should preferably be of Higher National Certificate standard in mechanical engineering and should have had experience in mechanical design and structural work including stress. Experience in the aircraft industry and/or on test rigs design would be distinct advantage.

THE positions offered are of a permanent and progressive nature and offer good remuneration commensurate with qualifications and experience. Full details of experience and qualifications to the Personnel Manager, The Fairey Aviation Co., Ltd., Hayes, Middx., quoting reference ED/4. [2398

AIRCRAFT engineers required. "A" and "C" licences preferred. Strong preference given to applicants with rotary-wing aircraft experience. Selected applicants must agree to serve overseas when necessary. —Write, stating age, fullest particulars of experience, details of licences and salary required to Box 6862. [2382

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EXPERIENCED airframe test rig designers wanted for work on new projects. Permanent posts for suitable applicants. Applications in writing should state age, experience and salary expected and be addressed to the Chief Designer, Auster Aircraft, Ltd., Rearsby Aerodrome, Leicester. [2414

TRAINEE draughtsmen are required by the English Electric Co., Ltd., Luton. A full-time course in draughtsmanship has been arranged for young men who are interested in the following aspects of engineering: airframe structures, electro-mechanical engineering, electronic equipment, jig and tool design and plant layout.

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AIRWORK GENERAL TRADING Co., Ltd., require a licensed engineer with "A" and "C" on Dakota aircraft, for an interesting overseas posting. Good rates of pay and allowances.—Apply to Works Manager, Airwork General Trading Co., Ltd., Blackbushe Airport, nr. Camberley, Surrey. Tel.: Camberley 1600, ext. 216. [2362

H. M. HOBSON, Ltd., invite applications for positions in the drawing office as follows: designers, detail and modification draughtsmen, checkers, stressmen. The work is concerned with interesting projects connected with fuel metering equipment and hydraulic flying controls for aircraft.—Hobson Works, Fordhouses, Wolverhampton. [0420

CHIEF draughtsman required to take charge of D.O. concerned with the manufacture of aircraft and commercial heat exchangers. Applicants must have production experience and be capable of supervising original design.—Details in confidence to Chief Designer, Delaney Gallay Limited, Vulcan Works, Edgware Road, Cricklewood, N.W.2. [2411

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THE HESTON AIRCRAFT Co., Ltd., seek more staff in senior and intermediate capacities in their drawing office and technical office. A variety of design problems are to be dealt with on aircraft and on guided weapons. Working conditions are good and there is a good pension scheme.—Apply to Chief Designer at Heston Airport, Hounslow, Middlesex. Tel.: Hayes 3844. [0237

ARMSTRONG SIDDELEY MOTORS, Coventry have vacancies for a number of designers and senior and junior draughtsmen. Although gas turbine experience is most advantageous, it is not necessarily essential as training will be given in this specialized work to suitably qualified draughtsmen.—Apply in detail to Reference P.103, Personnel Manager, Armstrong Siddeley Motors, Coventry. [0200

COMMERCIAL manager required for newly-formed Aviation Sales Organization. Must be fully acquainted with all aspects of aircraft brokerage, charter work and insurance and capable of building up and managing self-contained organization. A good salary will be offered and scope is unlimited for the right man. Send full details of experience and career to date to Box 6953. [2408

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for Military and Civil aircraft with an "A" licence for the latter, endorsed for Viking and/or four-engined aircraft.

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Employment Manager, Vickers-Armstrongs Ltd., Weybridge Works, Weybridge, Surrey.

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BRITISH EUROPEAN AIRWAYS require two engineering instructors at Northolt (transferring later to London Airport) to cover engine and airframe subjects. Qualifications: engineering apprenticeship with at least 5 years' aircraft maintenance experience; knowledge to A or C licence standard. Salary scale £602-£820 p.a. Applications with full details to Personnel Officer, Flight Operations Dept., B.E.A., Keyline House, Ruislip, Middlesex. [2404

EAGLE AIRCRAFT SERVICES, Ltd., Blackbushe Airport, Camberley, Surrey, have immediate vacancies in their production and inspection depts. for licensed airframe engine engineers and fitters, for Viking aircraft, Hercules engines, S.51 helicopters, Pratt and Whitney Wasp Junior, Alvis Leonides.—Applicants should apply to Personnel Office, stating qualifications, together with salary or rates of pay required. Free transport Camberley to Blackbushe. [2340

STRESSMEN of all grades, including seniors capable of taking charge of complete aircraft or components, are urgently required. Ability to initiate structural design and investigate design problems an advantage. Vacancies also exist for those qualified in mathematics and allied subjects wishing to take up a career in aeronautics. Good staff pension and insurance scheme, and good salaries offered.—Applications to be made in writing, stating age, qualifications and experience, to the Personnel Manager, Hunting Percival Aircraft, Ltd., The Airport, Luton, Beds. [2368

ASSISTANT chief engineer required by company engaged in the design and development of guided weapons. Candidates must be mechanical engineers with first-class qualifications and experience in electronics and light engineering. Knowledge and experience in servo mechanisms essential since duties would include responsibility for missile control systems, electrical gyros, accelerometers, etc. Applicants should be 30-35 years of age and have sufficient personality and experience to administer and organize the development activity on these subjects.
WRITE, in detail, quoting reference "G," to Box AC91033, Samson Clarks, 57-61, Mortimer Street, London W.1. [0562

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WORKS manager required for engine overhaul division. The applicant must have good technical qualifications and have had considerable experience of aircraft engine overhaul. He must have proven administrative ability and experience of material and stock control, progress, planning, and rate-fixing. Preference will be given to an applicant with experience of British and American engines. Salary will be in the range of £1,250-£1,500 per annum according to experience and qualifications.—Apply Personnel Manager, Box P410, L.P.E., 55 St. Martin's Lane, W.C.2. [2330

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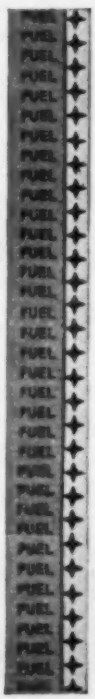

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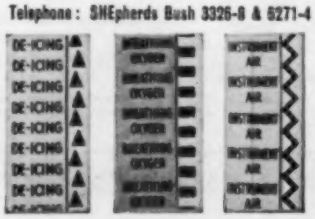

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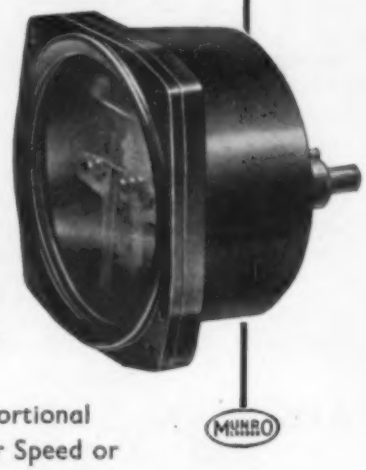

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INDEX TO ADVERTISERS

	Page
Alvis, Ltd.	13
Amal, Ltd.	24
Aviation Traders, Ltd.	23
Blackburn and General Aircraft, Ltd.	3
Bristol Aeroplane Co., Ltd., The	Cover iv
British Ermeto Corporation, Ltd.	16
Brooklands Aviation, Ltd.	20
Burnley Aircraft Products, Ltd.	6
Cellon, Ltd.	Cover i
Cross Manufacturing Co. (1938), Ltd.	18
De Havilland Aircraft Co., Ltd., The	12
Dunlop Rubber Co., Ltd.	20
English Electric Co., Ltd., The	20, 21, 22
E.R.S., Ltd.	23
Fairey Aviation Co., Ltd., The	11
Flexo Plywood Industries, Ltd.	17
General Electric Co., Ltd., The	15
Gloster Aircraft Co., Ltd.	22
Goodyear Tyre & Rubber Co. (Gt. Britain) Ltd., The	9
Gosheron and Co., Ltd., John	23
Headquarter and General Supplies, Ltd.	19
Hobson, Ltd., H. M.	7
Ilford, Ltd.	2
Iliffe and Sons, Ltd.	4
Lewis, Ltd., D.	18
Lucas (Gas Turbine Equipment), Ltd., Joseph	Cover iii
Muir and Adie, Ltd.	18
Munro, Ltd., R. W.	24
Opperman, Ltd., S. E.	17
Regent, Ltd., L. K.	18
Rists Wires and Cables, Ltd.	4
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Roe and Co., Ltd., A. V.	8, 21
Rollason, Ltd., W. A.	19
Sangamo Weston, Ltd.	16
Saunders-Roe, Ltd.	14
Short Brothers and Harland, Ltd.	1
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Teddington Controls, Ltd.	6
Vickers-Armstrongs, Ltd.	21, Cover ii
Wilson and Sons (London), Ltd., W.	17
Wolverhampton Aviation, Ltd.	18

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